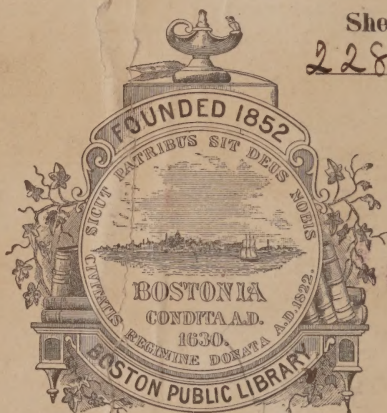


LESSONS
IN
THE NEW
GEOGRAPHY
TROTTER

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LESSONS

IN THE

NEW GEOGRAPHY

FOR STUDENT AND TEACHER

BY

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PREFACE.

WE live in a world of ideas. The real things of life impress themselves upon our brains, through our senses, and are grouped as so many mental pictures in the various complex relations which they hold to one another. In studying Geography the child very early gains ideas or mental pictures of different scenes and places, and it is of the utmost importance that these pictures be not only true, but *living* ideas of the things themselves. It should be impressed upon every child that Geography is a part of his everyday life, not a mere learning of the names of places, but a living reality. The imagination—that quality of the brain which enters so largely into child life, peopling its wonderland with fairies and creations of fancy—is the one element needful in gaining the ideas of real things. In proportion as a study stimulates the imaginative faculty does it near the end in view of all study—that of creating a fulness of interest in life and in the lives of every man and woman.

The purpose of this book is to bring this conception of Geography to the teacher's mind. The map is a means of gaining clear ideas of the positions of places on the earth's surface in relation to one another. We all carry mental maps in our brains. Our sense of direction is often determined by the early use or misuse of maps. Use the map to call out the perception of

the relations of a place to other places. Try to make every part of the map a picture alive with the men, the animals, the vegetation, rivers, mountains, cities, and all that goes to make up the real scenes, on any part of the earth's surface. Good illustrations are as useful as maps, and lantern slides are very helpful in the study of Geography. Modeling surface features in sand and clay, as outlined by Redway in his little book on "Geographical Forms," is a valuable aid in getting clear ideas of relief forms and their proper relations. Outdoor lessons — such as observations on the course of brooks and rivers ; on the position of springs and hill slopes ; on the different forms produced by water action ; on the weathering of rocks and soil formation ; on vegetation and its effects ; on familiar facts about heat and moisture ; on the change of seasons and the sun's position ; on the various home industries, food stuffs, and clothing materials ; on local history and the origin of place names — bring the child in direct contact with the facts, and are suggestive and inspiring.

Geography is a universal study, a band that binds many other studies into a living whole.¹ It is the central study to which the other studies must necessarily gravitate, because it is the study of the earth, and the earth is the theater of all human thought and action. For example, the expression of the mind of a people as embodied in its literature is largely the result of geographical influences. Who can doubt that the poetry and the art of Greece were the expression of that inspiration which is peculiarly the effect of bright blue skies and sparkling seas ; of genial, buoyant air, and softly blended landscapes, or that the brave Sagas of the Norse were born out of the gray mists and tempestuous waves of the northern ocean? On every literature Geography has left its

¹ See article by Dr. Charles De Garmo in "Educational Review" for May, 1893.

stamp. So with all study, the purely scientific and economical, as well as the more essentially human studies of history and art, all find a basis, a common groundwork, in Geography.

In writing this book I have been reminded of those early voyagers who made the study of Geography possible only by sailing around the earth. We all sail around the earth in the sea of our imagination. There are many who can never do it in reality, and if this little book will help them to sail and to see in fancy the real scenes, the moving and feeling life of the earth, the object for which it was written will be accomplished.

In connection with the chapters and lessons I have given lists of books that both the student and teacher will take pleasure in reading, and find useful in helping them to gain clear conceptions of the various scenes in different parts of the world. I have freely drawn material from several valuable works. I am especially indebted to Dr. D. G. Brinton's "Races and Peoples," Alphonse De Candolle's "Origin of Cultivated Plants," and articles on various subjects in the *Encyclopædia Britannica*.

S. T.

SWARTHMORE COLLEGE,
1894.

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LESSONS IN THE NEW GEOGRAPHY

INTRODUCTORY CHAPTER.

*GEOGRAPHY IN ITS RELATIONS TO LIFE.*¹

THE varied features of the earth's surface in any piece of landscape is a thing that rarely fails to strike the eye even of the most casual observer. He may take no mental note of this element of variety in itself, seeing only the stretches of field, the masses of woodland, the broken lines of hills, the winding course of streams that lie within his horizon. These are the broad features of almost every familiar landscape. From any given standpoint commanding such a view of the surrounding country the ground is seen to slope gently down to the lowlands, or fall more or less abruptly into a valley. Water from the rills of hillside springs gathers in the hollows, and wet, marshy land often forms a conspicuous feature in the near view. This diversified surface—river, marsh, field, forest, hill, and valley—is the home of an infinite variety of living beings.

Little observation is needed to note that this diversity of life corresponds, in a broad way, with the diversity of surroundings. Aquatic animals, like fishes, crayfish, and many insects, inhabit the waters of ponds, lakes, and streams. Frogs and other amphibious creatures are denizens of bogs and shallow pools. Some snakes and turtles are aquatic, while others are wholly lovers of the dry land. Birds are found in every situation,—ducks and divers on the lakes and rivers; herons and bitterns in marshy fens; gulls and petrels on the open sea; sandpipers along the shores; eagles on lofty mountain peaks; while a host of

¹ An address read before The College Association of the Middle States and Maryland at the meeting held at Swarthmore College, Pa., November, 1892.

species enliven the woods and fields. The haunts of mammals are no less diversified. The tree-loving squirrels, the burrowing ground hog, the mole digging out its long, subterranean galleries, the water-loving beaver and otter, are each and all associated in the mind with their favorite surroundings.

This idea of the animal and its particular home is by no means new. In that wonderful poem, the one hundred and fourth Psalm, the story is told in a language peculiarly its own: "The cedars of Lebanon, which he hath planted; where the birds make their nests: as for the stork, the fir trees *are* her house. The high hills *are* a refuge for the wild goats; and the rocks for the conies."

If this diversity of life is so apparent in a limited area, it is far more so when we come to journey over an extended portion of the earth's surface. As the horizon widens, newer and more significant features rise into view. Lofty mountain ranges, broad seas, trackless deserts, treeless plains, and vast forests successively present themselves as the traveler girdles the earth, north and south, east and west. Climate and vegetation change from one region to another, and it is not a matter of surprise to find corresponding changes in animal life.

Many kinds of animals are limited to particular regions, while others range through wide areas of country under a variety of physical changes. A traveler starting on the Atlantic seaboard of the United States and journeying westward along the fortieth parallel will pass successively through a number of distinct regions, each characterized by certain conditions of climate, vegetation, and peculiar animals. Quite a number of familiar forms will, however, be found throughout the entire extent of his journey across the continent.

In bird life alone, the absence of some species, the appearance of others in new regions, and the presence of some throughout a wide area of country, is a marked feature in such a journey. Many familiar eastern species, wrens, thrushes, titmice, wood-warblers, larks, jays, finches, and the like, give place to new,

though, in some instances, closely related, forms on the prairies and Great Plains. In the Rocky Mountain region the change becomes still more marked. So in the Great Basin and on the Pacific slope new and strange forms appear, characterizing the several regions over which the traveler passes.

He will find, however, that some old friends have accompanied him all the way to the shores of the Pacific. The robin greets him in California with the same loud, cheerful call that he heard in the woods of Pennsylvania. The familiar twitter of the barn swallow is heard about the habitations of men from shore to shore of the continent. Other well-known birds appear in every region throughout the land.

If our traveler cross the Pacific to Japan, he will find larks, wrens, finches, wagtails, titmice, thrushes, and a host of familiar forms, which he recognizes broadly as belonging to such types, though the species are all entirely different from those he knew in America. Should he sail westward by the shortest route to England, he would pass the shores of countries widely different from those he left and from one another. The bare hills of China, the wooded mountains of Formosa, the volcanic peaks of the Philippines, the hot, tropical jungles of the Malay Islands, the spice groves of Ceylon, the burning, barren deserts of the Red Sea, pass successively before him. Each is tenanted by strange forms of life — beasts, birds, reptiles, insects, and vegetation totally different from any he has ever beheld in his journey over half the earth. On reaching England he will again find himself surrounded by many familiar features. He will be surprised to see many species of birds almost, if not quite, identical with those he saw in Japan, separated as they are by the immense land mass of Eurasia, with its vast plains, deserts, and mountain-rimmed plateaus. None of the familiar species of North American birds, however, will greet him in his rambles about Britain.

We have seen that in an area covered by almost any farm of a few acres there exists a variety of physical conditions each of which is the home of living beings peculiar to it and different from

those in other stations. We have followed in imagination the traveler journeying westward over the earth, and have seen with him the varied features of the lands he visited. In the one case the conditions are *local*, in the other *geographical*, yet no line of distinction can be drawn between them, for geographical conditions are only the more exaggerated and broader features of what we see in any local area.

We learn from a survey of these conditions how intimately related an animal is to the earth, and how each species is fitted to the special conditions of the region it inhabits. Physical Geography, therefore, forms the basis of a study of distribution. The position of mountain ranges and valleys in relation to each other and to the surrounding country; the presence of rivers, lakes, prairies, steppes, deserts, and forests; the relative height of land above the sea level; the position of an ocean and the direction of its currents; climate in its broadest sense, including rainfall, humidity, the prevalence and direction of winds, — all these must be considered in relation to the distribution of life.

Humboldt laid the present basis of Physical Geography. Carl Ritter enlarged the thought of Geography as the all-important factor in life and human affairs. The multitude of facts collected by Darwin on the cruise of the *Beagle*, and Wallace in the Malay Archipelago, opened out a broad and suggestive field of thought. Obscure problems became clear in the new light shed upon them. The work of Lyell and other geologists bridged the gulf between the great Present and the infinitely greater Past, showing that the life of to-day in all its varied and obscure forms is the effect of physiographic causes working throughout the earth's history. *Time* and *Place* became the fulcrum on which thought was levered in turning the great questions of life. Evolution was the word and the light of science. Distribution was the key that unlocked many of the mysteries.

A new conception of the importance of Geography was at hand. Geography acted upon Biology and History, and they in turn reacted upon Geography. The Geography of our childhood is

remembered by most of us for its dry-as-dust detail and its entertaining pictures. Among these pictures none were more attractive than the zones of animal life. Seals, polar bears, and Eskimo struggled with one another in the frigid zone, with a precarious footing on cakes of ice under the conventional arch of an aurora borealis. Horses, cattle, herds of bison, wolves, deer, and bears were seen in all conditions of activity in the landscape of the temperate zone. The real menagerie feeling came out in the picture of the torrid zone. In one corner a dense jungle screens a tiger ever ready to spring upon the approaching antelope. Near by a herd of elephants are browsing. Hippopotami, rhinoceroses, and other creatures appear in the scene, while a herd of zebra or giraffe are invariably scampering off toward the other corner, where a secretary bird is finishing its serpent.

We learned, too, that the land was divided into continents — Europe, Asia, Africa, Australia, North and South America — islands, peninsulas, seaports, capes, and so forth; that Canton was noted for tea and china, Yokohama for Japanese, Philadelphia for Independence Hall, Rome and Greece for antiquity, and Buenos Ayres for hides and tallow. But we never knew *why* they were noted for these things, or what part their geographical position played in their history and exports.

In 1857 P. L. Sclater of the London Zoölogical Society gave a definite outline of Zoölogical Geography. There are powers of dispersal and barriers to dispersal. Animals increase rapidly in any given area unless checked by the presence of enemies or the scarcity of food. In a restricted area the food supply is sure to diminish from the increasing number of individuals. The animal must needs wander in search of new pastures and wider hunting grounds, and in so doing meets with barriers of a various nature which tend to check its advance. Of these barriers high mountain ranges, seas and wide rivers, deserts, deep forests, climate, the ocean, the presence of certain enemies and competitors for the same kind of food, are conspicuous. Certain species have greater facilities for overcoming barriers than others, some

by their ready adaptation to changed conditions, their more varied diet and powers of resistance, others by superior means of locomotion, as with birds and many mammals. In the lapse of time these two factors, *dispersive power* and *barrier*, tend to map out a definite territory or *range* for the animal to the physical conditions of which it is more or less adapted.

Changes of a geological nature now enter into our consideration as factors of the greatest importance in determining the ranges of various animals. Slight changes of level have, at no very remote geological period, caused sea and land to change places with each other, thus raising a barrier in a once continuous area. Climate and vegetation undergo change. The animal, cut off from the old land mass, diverges more and more from the parent stock, and in time appears as a distinct species.

The camels of the Old World and the llamas of South America illustrate this fact. Naturalists find abundant fossil remains, of a cameloid animal in the Tertiary strata of Western North America. It was long a standing puzzle how two such closely allied forms as the camels and llamas should exist in so widely separated areas. Here was the solution: The common ancestor of the two species arose in the area of country now forming the western portion of our continent. In the ages that followed, the descendants of this animal wandered in search of food, reaching the south and northwest. What is now the shallow Aleutian bank of the North Pacific was in the middle and later Tertiary a land area continuous with the northwestern and northeastern shores of America and Asia. The climate, too, was decidedly mild and supported a luxuriant vegetation as compared with these latitudes to-day. Sinking of the sea floor is still going on over a wide area in the Pacific, and it was this same subsidence which carried a continuous shore line beneath the sea, leaving only the highest points of land, as the Aleutian, Fox, and Kurile chain of islands. Extraordinary changes of climate followed, and extinction of animal life occurred over wide areas. The descendants of the camel-like beast that penetrated farthest into the Asiatic continent became,

in the long course of time, adapted to a desert life, appearing in the present age as the camels of Bactria, Arabia, and North Africa. Those that wandered south became isolated on the high Andes and, conforming to a mountain life, are to-day the llamas of South America. This is only one of many such suggestive problems that Geography has solved.

In accordance with the facts of distribution and the presence of certain barriers Sclater mapped out the earth into six great zoölogical regions. The great land mass of Europe and Asia north of the Sahara Desert and Himalaya Mountain range is regarded as constituting one natural primary region, Palæarctic or Eurasiatic. Africa south of the desert with Madagascar constitutes a second well-defined region containing numerous highly characteristic species of animals. Tropical Asia south of the great mountain barrier with the Malay Islands as far east as Borneo and Bali forms a third great region. The Australian, a highly peculiar and isolated region, includes the land mass of that name, Polynesia, and the islands of the Indian Archipelago to the narrow strip of water separating Lombok from Bali and to the Macassar Straits between Celebes and Borneo. North America to the Mexican highlands is the fifth or Nearctic; while Central and South America together comprise the Neotropical. The broad features of plant distribution conform quite closely to the faunal regions.

Here, then, is a natural geography based on the distribution of life. As the animal world has been so largely influenced by Geography, so man has been shaped, and his destiny hewn out mainly through geographical influences.

Biology has pointed the way toward a new conception of Geography and its importance as a point of view for all study—history, political science, linguistics, archæology, ethnography, even mathematics, and last but not least, commerce. What is more essentially geographical than “reciprocity”?

The New Geography is before us with a new significance, clothed with a perennial interest, for by it we are to see things in their

proper relations. The Old Geography is dead, a fossil buried in the drift of a past educational epoch.

We shall always speak of Europe as distinct from Asia, for it has long borne, in the light of history, a different geographical stamp. In the light of present knowledge, however, Europe can no longer remain a thing apart from the "land of the rising sun," for the Ural system forms no barrier between them. Even political boundaries are breaking down. Our children will learn about *Eurasia*, its climate and rainfall, its mountains, tablelands, and deserts, its great plains and river valleys, its widespread animal and plant life, and the influence of all these factors on the destiny of man.

As we linger over the teacups, let us be reminded that the plant which gives us so many pleasant hours is part of a long and wonderful story. When it grew wild, which was so long ago no one can remember, it must have looked very different from what it does now. Ages before this plant ever left its native shores it was cultivated by a curious people in the fertile valleys of the Yangtse-kiang and Hoang-Ho, doubtless making them happier by its genial influence. The climate of these valleys and their ranges of hills must have been peculiarly favorable to the growth of the tea plant, for it will not grow everywhere. The life of this curious race of people is full of interest; their civilization extends back for centuries and is lost in the dawn of history. What shut them out from the world so long? Great mountain ranges have always barred them off from the desert plateau of Asia. The warm, vapor-laden currents of the Pacific have ever borne in clouds that dropped their rains on the eastern mountain slopes, coursing back to the sea through fertile river valleys. Populous cities have stood for centuries on these river banks. Strange fish inhabit the waters; many birds and beasts roam through its forests. The land was sufficient in itself — its people stayed at home. At last the outer world, with its fleet of restless navigators, penetrated the shores of this strange country, and China, the Chinese, and the tea trade became factors in the world at large.

So Geography has linked Biology with History and Commerce,

since Biology first pointed out the New Geography, and Biology comes to mean more than merely what the microscope has to show.

Geographies and text books on biological subjects are useful as repositories of facts and for reference, but not as a means of recitation in the usual acceptance of the term. Too often they lack the spirit essential to the development of broad thinking and the clear conception of things. Nothing can take the place of direct contact with the real object and of the personality of teacher and student. The true spirit of culture and education is not in the amount of knowledge acquired, but in the attitude of thought toward a subject. Cultivate this attitude of thought. Learn to look for the significance of facts. Never lose sight of the cause and the effect. Facts are the raw material of thought, to be transformed within the man and reappear glowing with his personality,

When you read, read widely. History, travel, poetry, romance, biography, as well as Biology and Geography. Each in some way will light up the mind and help to clear the mists of ignorance. Lastly, as far as lies in your power, come in contact with the living life of the world. Touch it on every side. Books and study will soon wither the intellect unless the man or woman be alive to all the impressions that come to them from the great world of humanity and nature.

I have laid down no hard and fast methods of teaching. Individual experience is the best indicator of method. Let me say one thing, however. The value of Geography as a study lies in its relations with other studies. Political Geography, so called, hinges directly on Physical Geography, and the two should be brought before the youthful mind as essential elements of one great study. This aspect of the subject is History in its widest sense. It is also Natural History. Every shower of rain, every breath of air, every flower, every living thing, holds a lesson for us — in Geography.

The education of every child is the history of the entire race. The same world, stirring with life, still surrounds us; we are to feel it, to know it, to grasp its meaning if possible with a living sense of the eternal fitness of things.

CHAPTER I.

SOME PAST AND PRESENT ASPECTS OF THE EARTH.



READING IN CONNECTION WITH THE LESSONS OF THIS CHAPTER.

*Works marked * are especially useful.*

*Physiography. — Huxley.

Elements of Geology. — Le Conte.

*Comparative Geography. — Ritter.

*Darwinism (Chap. XII.). — Wallace.

*Humboldt's Cosmos.



LESSON I. — LAND AND WATER.

Coast Lines. — The coast or shore line — that line which marks the boundary between the great bodies of land or continents and the great bodies of water or oceans — is, and always has been, a scene of wonderful activity in the play of those forces which are so potent in the long process of building up and tearing down the surface features of the earth. We stand upon sandy beaches beholding the labor of ages, the long and slow piling up of grains of quartz into beds of immense thickness. On bold and rocky coasts we see the results of a grinding and wearing action in cleft and cove and overhanging cliff. The granite rock is mainly a mass of quartz, and the obvious conclusion as to the relations between the rocky headland and the low, sandy beach is that of cause and effect. Ever since the first land appeared the waves of the ocean have ceaselessly battered against

its rocky shores, some portions of which, more readily yielding to the disintegrating effect, have gradually worn away. The vast quantity of sand thus formed has been slowly shifted along the coast and spread over the marginal sea bottom. The further action of the waves heaps up this sediment into beaches.

Wave action is not the only source of sedimentation along the coast line. Rivers draining the land wash immense quantities of mud and sand out into the ocean, which form vast deposits at their mouths. In this way great deltas are formed when the river empties into a bay or gulf but little affected by the tides, such as the Mississippi, the Nile, and the Po.

This enormous deposit of earthy matter—sand and mud—occurring along the shore line has largely aided in producing the most important relief forms of the continents; namely, *mountain ranges*.

Height and Depth; Mountains and Sea Bottoms.—From the coast line, as the boundary between land and sea, the surface of the earth gradually rises on the one hand above the sea level, and on the other hand passes below the surface of the water to form the sea bottom. The land may rise more or less abruptly into a succession of hills, finally culminating in lofty mountain ranges, or broad and low plains may extend inland for many miles, gradually rising into some 'height of land.' The sea bottom may slope gently, extending many miles from shore as shoals and shallows. Sooner or later, however, it falls off more or less steeply into great depths, forming in this way a submarine bank.

The bottom of the ocean, like the surface of the land, is traversed by mountain-like ridges, the highest tops of which appear above the surface of the sea as *islands*. Many islands occur in groups lying off the shores of the continents, like the British Isles, Japan, the Philippines, etc., and have once formed a part of the mainland.

Mountain ranges stand in a certain relation to the oceans. The great ranges of the earth, as the Himalayas, Rocky Mountain

system, Andes, and the mountains of East Africa, rise from the lands bordering on the largest body of water,—the Pacific and Indian considered as one ocean. The Atlantic appears as a trough-like depression toward which the lands on either side slope gently as long plains, broken, in some instances, by smaller secondary mountain ranges. This is seen in the Great Plains and Appalachian system of North America, the South American selvas and pampas with the mountains of Brazil, the plains of Western Europe, the great African forest slope with the Kameroons and low elevations of the West coast.

The North Polar Area is a basin-like depression toward which the land gently slopes as long plains. The great plains enclosing the Arctic Ocean, are instances of this.

The great rivers of the world taking their rise in the higher mountain ranges traverse these plains and empty into the Atlantic and Arctic oceans. The Missouri and Mississippi in North America, the Amazon, La Plata, and Orinoco in South America, some of the larger rivers of Europe, and the Nile, Niger, and Kongo in Africa flow into the Atlantic or its inland-reaching seas. The Mackenzie, Yukon, and Nelson rivers in America, and the Dwina, Obi, Yenisei, and Lena in Eurasia, are notable streams of the Arctic slope. Few large streams find their way to the Pacific, because that ocean is nowhere surrounded by extensive plains.

Permanence of Main Geographical Features.—The large features of the earth's surface—the sites of the present continents and oceans—have always been much the same. Land and sea on a large scale have nowhere and at no time in the history of the earth exchanged places. The great depressions in the crust have from the very beginning been occupied by the oceans as the result of physical laws. Land first appeared above the surface of an ancient ocean, world wide in its extent, by an uplifting process which resulted from the very nature of the earth's genesis and history as a part of the solar system.

The earth was at one time much hotter than it is now, and its substance much softer and more yielding. Indeed, it is highly

probable that it started as a cloud of glowing vapors which gradually lost their intense heat and became liquid or molten in character. In this state it must have presented the appearance of a great ball of fused matter like the flux from an iron furnace. Still losing heat, its outer portion slowly hardened until a solid crust was formed of some thirty miles thickness. This crust cooled very unevenly, especially in its under layers, and as a result it shrank more in some places than in others, producing an uneven or wrinkled surface. As cooling went on, the dense atmosphere of vapor surrounding the earth was condensed into liquid or *water*, and this water filled up the hollows of the uneven surface. In this way the ocean was formed. It is altogether probable that this primitive sea spread around the entire earth, not only filling the great depressions of the crust, but even covering the tops of the highest ridges or wrinkles. The surface of the crust was now a sea bottom, and the cooling and shrinking process still going on in its deep layers, the great wrinkles were finally pushed or lifted above the surface of the ocean and appeared as the first *land*. In this way the present broad features of the earth were, at a very early period, roughly mapped out. This shrinking process took place at a very slow rate, and is still going on in many places, unnoticed, however, on account of the extreme slowness of its movement. In some parts the crust is *sinking*, in others *rising*, the one often complementary to the other. This change of level was without doubt true of the Mediterranean region in a past period of the earth's history. It was anciently a land area which slowly sank, letting in the waters of the Atlantic Ocean, at the same time leaving scattered remnants of the old land mass above the surface in the form of numerous islands and peninsulas. These islands and peninsulas were the highest parts of ancient mountain ranges which were not entirely carried under by the sinking process. To this fact is due the present peculiar features of this remarkable inland sea and their effect on the development and destiny of various nations. As this portion of the crust sank, the present area of

the Sahara desert, then a sea bottom, probably arose, and its vast deposits of salt help to confirm this fact. So in the Pacific Ocean the entire sea floor has been sinking for thousands of years, while the western part of North America has slowly risen to form the plateau region. Off-shore islands separated from the mainland by shallow straits and seas offer evidence of a submerged shore line. The coast of Norway is said to be rising, that of Greenland sinking, and this last fact is so well recognized by the natives that they never build their dwellings near the shore. Huts previously built on the edge of the sea now stand partially submerged.

The Thousand-fathom Line and what it teaches. — Though the continents and oceans have undoubtedly occupied their present positions from the beginning, yet changes in the relations of land and sea have frequently occurred. These changes have been along the shore line. In his work on "Darwinism" Alfred Russel Wallace devotes some space to the subject of the thousand-fathom line about the continents and its probable significance. In his map he shows by a contrast of color the former much wider extent of the shore lines of the continents as marked by the depth of a thousand fathoms off shore. All within this line to the existing shores of the continents represents, in all probability, *lost land*—land that has sunk beneath the waves. The significance of this becomes apparent when we study the Mediterranean region in all its past and present relations; the northern regions of Eurasia and America in relation to the North Atlantic and Pacific areas; the groups of islands lying off the shores of the continents; the shores of the Indian Ocean, Australia, and the islands of the Malay Archipelago in connection with their past and present life features.

It is not within the scope of this book to enter at length into these inviting problems. Bear in mind, however, that it is along the coast lines of the continents that the changes of level have occurred, which, in the course of time, have so greatly modified the surface features of the earth.

"I drive my wedges home,
And carve the coastwise mountain into caves.

I with my hammer pounding evermore
The rocky coast, smite Andes into dust,
Strewing my bed, and, in another age,
Rebuild a continent of better men.
Then I unbar the doors: my paths lead out
The exodus of nations: I disperse
Men to all shores that front the hoary main."

Origin of Mountain Ranges. — The situation of mountain ranges in relation to the oceans is explained in the following way. The shore line, as already stated, is the seat of a vast accumulation of sediment, often many thousand feet in thickness. In past time these enormous beds of sand and clay become hardened or consolidated throughout their underlying portions from the pressure exerted by the increasing weight of the top layers, and strata of sandstone, shales, and slates were thus formed. The immense weight and pressure of these rock beds induced a greater degree of heat in that portion of the crust included in the area of marginal sea bottoms, and this heat tended to soften the rock mass. As a result of the expansion of the heated area surrounded by the more rigid crust layers a certain amount of lateral pressure took place from time to time, causing a bulge at the most pliable point, namely, the marginal sea bottoms, and this bulge finally appeared above the surface of the ocean as new land added along the beaches of the old. Increased pressure upon the edges of these great beds of softened rock, from movements in the surrounding portions of the crust, would, likewise, continue to push the new land higher and higher until it appeared as a mountain range flanking the shores of the ocean. The experiment of taking layers of clay in a suitable vessel of water and pressing on the sides of the clay with the hands gives a similar result. Indeed, it is highly probable that mountains originated in this way, as is shown by the following proofs. 1. The flanks or sides of mountain ranges consist of immense beds of *stratified rocks*, and stratified rocks are the con-

solidated sediments formed by water. 2. These stratified rocks contain the fossil remains of marine animals in abundance, showing that at one time they must have formed a part of the sea bottom. 3. The interior or central core of a mountain range consists of granite-like rocks, massive and dome-shaped, over which the stratified rocks lie like a saddle. Granite, gneiss, and various other crystalline and glassy rocks form the great bulk of the crust underlying the sedimentary or stratified rocks, outcropping here and there upon the surface. They are igneous or fire rocks, having cooled and crystallized from an original highly heated, molten mass. Mountain ranges thus appear as upheaved marginal sea bottoms.

The Heat of the Earth; its Cause and Effects. — Geologists now incline to the theory that the earth consists of a densely solid central mass between which and the outer crust are areas of semi-fluid material in a state known as *hydrothermal fusion*, or fusion in the combined presence of heat and water. These heated, semi-fluid areas are manifested on the surface in various places as the outpouring of lava or melted rock from volcanoes, and the presence of geysers and hot springs. The cause of the internal heat and fusion is not thoroughly known, but is thought to be due largely to the crushing and grinding action of immense masses of rock and in part to a chemical action.

The effect of the earth's internal heat over large areas is conspicuous. In Western North America vast fields of lava occur from the overflows of ancient volcanoes. The Pacific Ocean is surrounded by volcanoes both active and extinct, and this in connection with the sinking of the sea bottom and the near presence of high mountain ranges, among which many of the volcanoes are situated, throws considerable light on the fact that interior heat is probably the primary cause of many surface features. Outside of this region the Mediterranean volcanoes, in an area of subsidence, are also remarkable.

This earth energy finds its primary cause in the source of all planetary energy — the sun. The earth has passed, in its long

history, from a sphere of cloudy vapor through a liquid, into an increasingly contracting solid state. Through all this it has steadily lost heat, and its present activities are only the ghosts of its past giant forces. Like its satellite the moon, it is destined to pass from old age into a cold, dead planet destitute alike of air, water, and life.

The Action of Water. — The elevating force, converting portions of the primitive sea bottom into a land surface by lifting it above the surface of the ocean, has always had a counteracting agent in the destructive force of water. No sooner was any considerable land surface presented above the sea level than the vapor of the ocean, condensing into clouds, poured as torrents of rain upon the face of the dry earth. Rain soaks through soil, finding underground channels which bring the water to the surface again as springs, or, when in excess, runs off the surface in muddy rills. All this water is ultimately gathered into streams flowing from higher to lower levels, and through the large rivers it finally reaches the ocean whence it started. This circulation of meteoric water is attended by a slow but impressive wearing down of land surface. The action of the atmosphere in disintegrating rock into soil still further prepares the way for the destructive action of water. Water itself is not the eroding agent; the sediment or grains of sand which it carries in suspension is the graving tool sculpturing the face of the earth throughout all ages of time. At a distance we behold the mountains in mass and outline standing against the sky, seeing, as a geologist somewhere expresses it, only the evidence of the uplifting forces of nature.* Once among the mountains, we lose sight of this, seeing only the mighty effects of water, — gorges, chasms and ravines; bare, jagged cliffs; torrents and cascades cutting their way still more deeply into the solid rock. Everywhere, in lowland and highland, by the seacoast and on the tops of mountains, we see the marvelous results of the action of water.

The varied features of scenery are largely the result of the cutting and carrying power of water. Valleys, flumes, cañons,

and cataracts are prominent features of the cutting or erosive action of water in all parts of the earth. In the lower reaches of rivers, broad flood plains are formed by the checking of a sediment-laden current as it meets the incoming tide of the ocean. The river spreading out in times of flood, drops its burden of mud over a wide area, leaving broad, marshy flats when it recedes into its main channel. Plains thus grow by the accumulations of mud carried down by rivers as a result of erosion in their upper or torrential courses. Deltas are similarly formed by the velocity of the rivers' flow, carrying mud out into a comparatively tideless body of water. These low, marshy regions are peculiarly liable to overflow, as in the case of the Nile, the Mississippi, the Ganges, the Po, and the rivers of China.

In the form of ice, as glaciers, water has sculptured the surface, making a characteristic landscape in many countries. In a past age of the earth, glaciers spread widely over many northern lands, leaving a 'drift' of boulders and moraines, billowy hills, river terraces, and wide mountain valleys as characteristic features of scenery. The effect of the glacial period upon climate and the distribution of life and its probable relations to early man are subjects of extreme interest.

Action of the Atmosphere. — The chemical action of rain water gradually dissolves the cementing material of rocks, allowing them to fall away as loose masses of sand and earthy matter. In this way soil is formed by the so-called 'weathering' of rock. The effects of frost in breaking up masses of rock are conspicuous in temperate and cool countries. Water penetrating into rock fissures expands in freezing, and in this way plays an important part as a disintegrating agent.

On low, sandy beaches the wind piles up the sand into immense dunes which flank the shore for miles and gradually work inland, frequently encroaching upon, and in some places entirely obliterating forests and fertile lands. The same is true of the desert sands, the winds blowing them from deserts over neighboring countries. In this way they gradually encroach upon fertile lands

and in time completely overwhelm them. This is seen in some parts of Egypt and along the borders of the Sahara, where the desert sands are piled about the bases of the Pyramids and over the vegetation of the Nile Valley.

Living Matter and its Effects. — The soil of a forest is the accumulation of the fallen leaves and rotting tree trunks of centuries. It is known as *vegetable mould*, and in most places, wherever plant life abounds, forms an important element of the soil. In the presence of water, as on the shores of a lake or in a marsh, and where the climate is sufficiently cool and moist, this vegetable matter is slowly converted into thick beds of a black, mud-like material known as *peat*. Still further compression and solidification by overflows of silt and clay bring about a hardening, and this fact throws light on the probable origin of the coal measures in various parts of the world. Peat bogs often form in a comparatively short period, in some instances entirely hiding important landmarks. Thus in Europe, old Roman roads have been lost under peat formations. Bog iron ore, the workable form of the metal, results from the presence of organic matter which takes an excess of oxygen, and thus reduces the iron from its higher state of oxidation. It is in this higher, but unworkable state, that iron exists widely diffused through the crust, imparting a characteristic red color to many soils.

Limestone and accumulations of lime result from the immense deposits of the shells of various marine animals, notably the Foraminifera and coral polyps. The chalk of France and England is a hardened material almost identical with the lime ooze of the Atlantic sea bottom, and undoubtedly represents an upheaval of this deposit in past ages. The growth of coral polyps has reclaimed lost land over a considerable area in the Pacific, growth taking place at a slightly faster rate than the subsidence of the sea floor. In this way numerous reefs have been formed, on the tops of which islands are gradually built up by wave action. Birds, winds, and ocean currents carry the seeds of plants and disperse them over wide areas. By this means vegetation has sprung up

and covered many of these islands.¹ Extensive caves often occur in limestone districts from the dissolving action of underground waters containing carbonic acid. In many places these caves have played an important part as shelters in the early history of mankind.

Soil and Forests. — The character of the soil often influences the vegetation over wide areas. This results largely from the nature of the combined elements of soil, giving rise to certain mechanical conditions. Thus a soil made up largely of sand is loose, allowing water to percolate freely through its beds, while a clay soil is stiff and lumpy and more or less completely impervious to water. A mixing of these two elements, sand and clay, is undoubtedly the best soil for plant growth: The stiff loam of our middle prairie lands may possibly have been a factor operating against the growth of a forest. The roots of plants penetrate the soil, thus forming channels along which water finds its way. Earthworms likewise perform an important part in plowing the soil by bringing the deeper layers to the surface and thus exposing them to the influence of air and sunlight. The roots of plants tend to hold soil together and prevent its too rapid washing by rain and rivers. Marshes are formed in this way, the sod of mud and grass roots being often two and three feet in thickness.² The vegetable mould or *humus* from the decay of plants forms an important element of soil, and a source of food supply to the seedlings and young undergrowth.

¹ In tropical seas the completion of an island is often due to the growth of the mangrove and cocoanut. The mangrove is a tree of low, marshy seacoasts, and grows out of the water, spreading itself by the formation of adventitious roots, or long branches that strike downward from its limbs and take root in the mud to form new trees. The conditions of shallow water on the top of a coral reef or a submarine bank are entirely favorable to the growth of this tree, and its form of reproduction is curiously fashioned for dispersal over shallow seas. Mud accumulates rapidly about the mangrove roots, and forms a resting place for the cocoanuts that drift about in their tough, buoyant husks. Dry land gradually appears from the growth of mud, and this is soon covered with the tall palms and low mangrove swamps which are so characteristic a feature of tropical shores and islands.

² See article by J. Gifford on "Salt Tide Marshes of South Jersey;" *Science*, Vol. xxii, 556.

Forests have an important influence on the climate and rainfall of a country. Their canopy of foliage acts as a shelter from the heat of the sun and the washing effects of rain. The immense area of leafage exposed acts as a vast evaporating surface and also radiates heat into the surrounding air, thus equalizing the conditions of moisture and temperature. By this means prolonged periods of drought followed by heavy downfalls of rain are averted and the perennial flow of springs is maintained. The forest has exerted an important influence on mankind throughout history. It has formed a natural hiding place and shelter, a harbor for the wild animals of the chase, a source of timber supply and of many varieties of food. By no means the least has been its widespread influence upon climate. In the advance of civilization the cutting off of the forests is a menace to the welfare of a country.

LESSON II.—LIFE AND THE EARTH.

Life a Part of the Earth's Surface.—The greatest feature of the earth's surface is the life that dwells upon it, and of which man himself forms a part. The multitude of living beings that find a home in the waters of ocean, lake, and river, or on the surface of the land, are, each and all, a part of this wonderful sphere, in every way dependent upon it for their existence. The simplest speck of jelly endowed with this living or vital principle; the highest creature, man; the grass and flowers that make beautiful the face of the land; the rock masses and minerals of the crust, were all breathed into existence as a part of the earth. The infinite variety of the living beings that people the earth is the result of life having slowly unfolded from the simplest beginnings, like a plant from its seed. *Life is the earth itself.* Without life the earth would be a dead sphere; a world without a history.

Animal Life.—Two kinds of living beings inhabit the earth,—animals and plants. Some kind of animal is found in every part of the earth, from pole to pole, and from the highest mountain

summits to the deepest depths of the ocean. The wonderful variety of forms is a striking feature of animal life. The animal is fitted to all conditions of existence — the fishes and creatures of the sea to a life in the water ; the land-living or air-breathing forms to the varied states which such a life offers.

The higher animals, like the backboned creatures, — beasts, birds, etc., — are distributed over the earth in relation to climate and other causes which led in past time to their present geographical distribution. First among these causes was the search for food, brought about by the cutting down of the food supply in the places where they lived, on account of the increasing number of individuals. Wandering over the earth, they met with various checks or barriers as changes in climate and the presence of deserts, oceans, and mountains, which tended to stop their wanderings in certain directions, producing in time the present features of animal distribution.

Vegetation. — Plant life is widely spread over the face of the earth, giving rise to prominent features of various regions. Some regions are covered with vast forests ; others are treeless pasture lands ; others, again, are deserts of rock and sand, with only a coarse and scattered vegetation. All this is largely the result of climatic conditions, notably rainfall, as well as topographical features, or lay of the land (highlands and lowlands). The character of the vegetation differs in various regions. The virgin forests of the tropical zone abound with the most wonderful forms and varieties of plant life. The vegetation of the temperate zone is a strong contrast to this, forests of entirely different trees characterizing the landscape. The Arctic regions are, for the most part, barren wastes, covered here and there with a few stunted alpine shrubs and wild flowers.

The Air or Atmosphere. — The atmosphere is the gaseous envelope surrounding the solid earth, and extending to the height of many miles. It is literally an ocean of air in which we and all other land animals live, containing a principle without which life could not exist. This principle is a gaseous element called *oxygen*.

Its Relation to the Surface. — The air is the great reservoir into which a large portion of the surface water of the earth passes as vapor to be circulated over the land in the form of *clouds*. These clouds are carried by currents of air or *winds*, their vapor falling as *rain*, to be again returned to the ocean through the rivers. It is also the great distributor and equalizer of the sun's heat, receiving the heat radiated from the earth's surface and modifying the direct rays of the sun passing through its cloudy vapors. The water of the ocean is salt, from the various mineral matters that are leached out of the rocks by rain water, and carried into it through the rivers ; but by evaporation into the air it becomes fresh, the salt being left behind. Hence rain water and the water of springs, rivers, and many lakes is fresh.

Its Relations to Life. — Without this atmosphere or air life were not possible. It is the great medium from which animals and plants draw the materials for their existence, and through which the interchange of material between the plant and the animal takes place. The animal breathes in the oxygen of the air to carry on its vital activities. This act of living in the animal produces a waste material called carbonic acid, which the animal throws out as a gas in its breath. This goes into the atmosphere, and is the substance upon which the plant feeds. Its leaves absorb carbonic acid gas, and this is converted into starch, which forms a large part of the plant's substance. The animal, in turn, feeds on the plant, thus getting back material to make good the loss to its body caused by the wasting action of oxygen. The plant also at times gives out oxygen from its leaves into the air. Both plants and animals absorb a great deal of moisture from the atmosphere and throw it off again from their bodies. Animals living in the water get their oxygen from the air, though indirectly, as water always absorbs a certain amount of air, especially when it foams and breaks on the surface.

We thus see how animals and plants are dependent for their very existence, upon one another and upon the atmosphere.

Distribution ; Primary Life Areas of the Earth. — The ques-

tion of the distribution of animals and plants over the earth's surface under the conditions of climate, topography, etc., resolves itself into the consideration of seven primary areas characterized by the number of peculiar forms, of both animals and plants, in each.

Dr. J. A. Allen has recently summed up his views upon this subject in an exceedingly interesting and valuable paper.¹ In our Introductory Chapter the divisions as outlined by Sclater in 1857 were briefly alluded to. In the lapse of more than thirty years many facts have been ascertained in both Biology and Geography which shed new light upon the subject. These are embodied in Dr. Allen's classification of the life areas as follows : —

“(1) An *Arctic Realm*,² occupying the region northward from about the limit of forest vegetation, or from about the isotherm of 32° F. It is characterized by its paucity of life and its homogeneousness, nearly all its forms of both animal and vegetable life ranging throughout its whole extent.

“(2) A *North Temperate Realm*, extending from the northern limit of forest vegetation to the northern border of the palm belt, or between the annual isotherms of 32° and 70° F.

“(3) An *American Tropical Realm*, consisting, as the name implies, of tropical America.

“(4) An *Indo-African Realm*, consisting of Africa (except the northern border), and tropical Asia and its outlying islands.

“(5) A *South American Temperate Realm*, embracing extratropical South America.

“(6) An *Australian Realm*, including not only Australia, but New Guinea, New Zealand, and the various groups of islands to the northward and eastward.

“(7) A *Lemurian Realm*, consisting of Madagascar.”

From this it will be seen how closely the life areas conform to climate as well as to the general distribution of the land masses.

1 “The Geographical Origin and Distribution of North American Birds, considered in Relation to Faunal Areas of North America,” *The Auk*, April, 1893.

2 The few circumpolar animals and plants do not seem to warrant the separation of the Arctic into a primary life area. It is a part of the North Temperate Realm, there being no land or ocean barrier between them, and its peculiarities are the result of the low temperature. — S. T.

The North Temperate Realm embraces two regions: (1) the *North American Region*, consisting of temperate North America; and (2) the *Eurasiatic Region*, consisting of temperate Eurasia. The life forms of these two regions are very similar in many instances. Thus a species of bear, lynx, and wolf are essentially the same in both. The red deer of Europe has its counterpart in the so-called 'elk,' or wapiti, of North America. So with the bison and auroch and several other closely allied forms of animal life. A general similarity characterizes the broad features of vegetation in the two regions. A zone of deciduous trees, oaks, willows, beeches, birches, etc., with a belt of pines, larches, and other conifers to the north, and a vast assemblage of herbaceous forms, give character to both the North American and Europæo-Siberian forests.

The American tropical and Indo-African realms, though under very similar conditions of climate, are strongly contrasted in their life forms on account of their wide separation by the ocean. The South American tropical forest, with its gigantic cinchonas, green hearts, cow trees, and other remarkable forms; its curious sloths and anteaters; its hosts of peculiar birds (among them the humming birds), and its general scarcity of large mammals, is strikingly opposed to the tropical life of the Old World with its peculiar baobabs, banyans, giant grasses like the bamboo, and other no less remarkable forms of vegetation, and the wonderful development of large mammalia, — elephants, rhinoceroses, buffaloes, antelopes, zebras, the giraffe, hippopotamus, the man-like apes, leopards, lions, tigers, and hyenas.

Australia and its adjacent islands are especially remarkable for the development of marsupials or pouch-bearing mammals, like the kangaroo and wombat, the curious duckbill and echidna, numerous peculiar birds, and characteristic forms of vegetation, such as trees with leaves turned edgewise to the sun. Madagascar is the home of most of the existing species of lemur, a group of monkey-like mammals which was once widely spread over the earth. The South American Temperate Realm has a life largely derived from the tropical region to the north modified by temperate conditions. These

last three realms, the Australian, Lemurian, and Temperate South American, have derived their special life features from their peculiarly isolated position in relation to the rest of the great land mass reaching back to a very remote period of time. Madagascar, Australia, and the adjacent islands are the result of subsidence which surrounded them by an ocean barrier, while temperate South America is isolated by climate, being cut off from the North Temperate Realm (save along the higher ranges of the Andes) by the tropical zone.

In a general view of the distribution of vegetation over the earth, we see the effect of climate as a primary cause, giving rise to a series of vegetable zones or belts characterized by the predominance of certain forms. These correspond to the annual isotherms, the great forest regions being the result of the special conditions producing an abundant rainfall. Mountain ranges trending north and south carry temperate conditions far into the tropics, thus aiding the wide dispersal of temperate forms of both animals and plants. We thus recognize an *arctic belt* of stunted vegetation extending to 32° F., a *temperate forest belt* from 32° to 70° F., and beyond this a *palm belt* of tropical vegetation in general. (See Climate, Isotherms.)

The North American Region is divided into two *Subregions*: (1) a *Cold Temperate Subregion*, and (2) a *Warm Temperate Subregion*. The Cold Temperate Subregion extends across the continent, reaching from the northern limit of forests southward to about the mean latitude of 43° N. Its southern border is extremely irregular, owing to topographical conditions. The Appalachian Mountain range carries cold temperate features southward along its crest, appearing as a narrow belt penetrating the Warm Temperate Subregion. The influence of the great plains of the Saskatchewan, on the other hand, pushes its southern boundary line far to the north. The Warm Temperate Subregion extends southward from this line to the palm belt or the northern limit of the American tropical realm. It is subdivided east and west as a result of physical conditions into two provinces:

(1) an eastern or *Humid Province*, and (2) a western or *Arid Province*. These subregions and provinces are remarkably well defined by their life forms, both animal and vegetable. Their boundaries are nowhere abrupt, but overlap or pass gradually into one another.

Certain broad features of flora characterize the subregions of North America. The Arctic Realm to the north is a region of saxifrages. The Cold Temperate Subregion is especially characterized by the abundance and variety of asters and goldenrods besides numerous heath-like forms, as the various species of huckleberries. Among forest trees the great variety of oaks and spruces is characteristic. A striking feature of the Warm Temperate Subregion is the abundance of magnolias, while tulip poplars, horsechestnuts, and locusts are conspicuous trees in the woodland landscape. These forms are all noted for their magnificent blossoms. This subregion is also the center of rice, cotton, and sugar cane growth in the United States. Wheat and maize are grown over both subregions, though the latter attains its best development and highest degree of cultivation in the Warm Temperate. The *Humid Province* is throughout a fertile region, the greater part of its area being under cultivation. West of the 100th meridian the eastern edge of the Great Plains forming the North American Plateau, marks the beginning of the *Arid Province*, characterized by the agave, yucca, and cactus forms of vegetation.

Sequence of Life. — Living beings present a gradually unfolding series in the history of the earth, from simple beginnings to later complex forms. The oldest stratified rocks contain the remains of single-celled organisms in all respects like the lower forms existing to-day, and throughout the immense lapse of time, since life first began, the strata of the crust bear testimony to this unfolding plan of development. The older forms of life were aquatic, like the lower forms of to-day, water being the primitive element of existence. It was not until the atmosphere had parted with its excess of carbonic acid, through the action of the wide-spread vegetation of the Carboniferous period, that air-breathing animals appeared.

In a universal 'struggle for existence,' which is a law of life, living beings strive to fill unoccupied places in the economy of nature, and in time become adapted to new conditions through a change in function and structure. This gives rise to diversity and subsequent 'origin of species.'

Conditions of Life ; Environment. — The earth's surface is the home of life — hence, the conditions of the surface are the conditions of life — or its environment. Land, air, water, heat, and sunlight are essential conditions of life. The distinctive feature of living matter is energy in the form of motion, growth, and reproduction. This results from the activity of oxygen, or combustion — the never-ceasing attack of that element upon living matter in an effort to form combinations with its elements. Waste of the living organism ensues, necessitating a constant renewal by food. This food is obtained from the surrounding elements, and is an important condition of life.

The Unity of Life. — Life, then, is a part of the earth's surface dependent upon its conditions for existence. From the lowest and simplest organism — a mere speck of jelly — up to the highest and most complex, as in man and the higher animals and plants, this unity of life, this dependence upon the same primary conditions, forms an essential and conspicuous feature. Furthermore, the most complex animal exhibits in its individual development the same steps as are seen in the long history of life as a whole. Whether we view the individual or the race, each alike begins as a simple germ potent with unseen but marvelous possibilities.

Intelligence. — Man, as the crowning work of this wonderful thing called 'life,' reflects that intelligence which seems to pervade all nature. He only, of the countless living beings, has recognized that 'something,' higher and greater than all life and nature, that —

"divinity that shapes our ends,
Rough-hew them how we will."

The forces of nature have slowly wrought out through the long centuries of time the present aspects of the earth. Not for

themselves alone have these forces operated. The intelligence that manifested itself with the development of man as a part of nature grasps the inheritance of time, the opportunities of environment, rising above the mere blind instincts of the animal. Climate and physical forces no longer coerce man into complete subjection. A noted geographer once wrote a work entitled, "The Earth and Man."¹ In view of the intelligence that has so far fitted its home to suit its own purpose, might we not as truly say, Man and the Earth?

LESSON III.—CONDITIONS AFFECTING THE DEVELOPMENT OF MAN.

Mountain Walls.—The relative position of mountain ranges, table-lands, plains, and valleys, and the resulting determination of water courses have exerted an important influence in the history and development of man. The preservation of early civilizations, as those of China and India, and in later times that of Rome, though subject to barbarian invasion, was largely due to their position in lowlands flanked by lofty mountain barriers. The Swiss owe their long independence among the nations of Europe mainly to their impregnable position among the ranges of the Alps. So with Greece on her islands and mountainous peninsula. France and Spain have been greatly protected by a mountainous border; while Austria, lying open to the Black Sea and the plains of Central Europe, has been from time to time the scene of inroads by Asian peoples, as attested by her present relations with Hungary and the Danube countries. The early settlements of North America, as Professor Shaler has shown, owe their preservation in great part to the nearness of the Appalachian ranges, which shielded them from the greater body of savages occupying the region west of these mountains. The Peruvian civilization was developed on the western slopes of the Andes under almost temperate conditions of climate, and protected by the snowy

¹ Guyot.

crests of the range from the savages of the tropical forests to the east. Hardly anywhere do we find a better example than this of a mountain's influence in developing man; for even the extreme dryness of the region was overcome under the stimulating effects of altitude.

Mountain walls have had other influences than merely protecting man from man. They are one of the most important regulators of rainfall, and hence determine the fertility of a region. China and India, the northern shores of the Mediterranean, the Pacific slope of Western North America, are examples of this influence.

The character of mountain ranges themselves has played an important part in more or less completely separating neighboring countries. The Alpine passes have been important factors in history, permitting intercourse among various European peoples. The Himalayas, on the other hand, broken by only a few passes, and those at a great height, have effectually isolated the surrounding countries from any extended intercourse with one another.

“Mountains interposed
Make enemies of nations, who had else
Like kindred drops been mingled into one.”

Continental Irregularity. — The outline or contour features of a continent have played a very important part in the development of nations. The deeply dissected coast line of Europe has greatly affected the history of the various peoples inhabiting the continent. A glance at the map of Europe is sufficient to show how vast an extent of seacoast is presented by its irregular shore line in relation to the entire territory. With the exception of Switzerland there is not an important country in Europe that does not possess a more or less extended seacoast, and that within temperate latitudes. Nearly all the important points of Western Europe are thus within easy reach of the sea. This has had an important influence in the destiny of European nations. The fostering influence of a sheltered body of water like the Mediter-

anean was an important factor in the development of the early seagoing nations. Phoenicia, Greece, Rome, Carthage, Venice, were all nurtured under the protecting headlands and sheltered bays of an irregular shore line. Holland has been reclaimed from the sea. Spain has sent fleets from both Mediterranean and Atlantic shores. The Baltic nations have been seafarers from the days of the Vikings to the present time. The British Isles owe their great human interest in history to the sinking process that gave to the shores of Western Europe their present jagged outline.

In like manner Eastern North America was open to the early discoverers through its far-inland-reaching estuaries and navigable rivers. We may thus, for example, trace the history of colonization along the Great Lakes and the Mississippi Valley.

South America and Africa have a comparatively even coast line, no great bays reaching far inland. Many of the rivers of Africa present a series of dangerous rapids for many miles before entering the low coast regions. This is especially the case with the Kongo and the Nile. The effect of this upon the inhabitants and the difficulty which civilized man finds in penetrating to the interior is in a large measure the reason why Africa is still a "Dark Continent."

River Valleys and Garden Spots. — All the great civilizations of history began in fertile river valleys, — Egypt in the fertile valley of the Nile, surrounded on all sides by the desert; Babylon and the Assyrian civilization in the valleys of the Tigris and Euphrates. The Hindus on the Ganges and the Indus, the Chinese on the Yang-tse-kiang and Hoang-Ho, are examples of the river's influence in the development of civilizations. In later times the Tiber and the Po nurtured the germs of great civilizing centers. In our own country the river valleys were the garden spots which invited the first settlers. Even in savage countries the densest population is along the great rivers. The navigability of rivers, as already alluded to, has been of the utmost importance to the peoples of history.

Effect of Topography on Early Civilizations. — A broad, arid belt of country extends from the shores of the Gulf of Oman, through the desert tracts of Beluchistan and the mountains of Afghanistan to the neighborhood of the Pamir. From this lofty region the land falls away into the brackish plains about Lake Balkash and the Kirghiz Steppe and extends northward between the Obi and Yenisei valleys into the dreary tundras of Arctic Siberia. This mountainous and desert tract of country formed the true dividing line between the East and West¹ of the ancient world. Sparsely inhabited by a few rude and warlike peoples, it separated swarming centers of population on either side. To the east were the great Asiatic civilizations of India and China; to the west, the densely populated centers of Egypt and Mesopotamia. The great contour and relief forms on either side of this barrier zone had an important influence in the destiny of nations. The axes of civilization in the old oriental world were *divergent*, the centers of population being separated by giant mountain ranges and isolated on peninsulas. The only great migratory movement was divergent, and peopled the Malay and Pacific islands at a remote period of time. West of the great barrier strip, the Persian Gulf and Mesopotamian river valleys, the Red Sea, the lower Nile and the shores of the Black Sea formed natural highways *converging* toward the Hellenic Mediterranean. In later times this historic region became the divergent focus of a migratory movement that civilized Western Europe.

The distribution of minerals, plants, and animals, and the conditions of climate have been throughout all time among the most important factors in the development of man. These will be further alluded to in later chapters. The great end in view through the operation of these various physical conditions is the evolution of the social state of man. Man and Man as well as Man and the Earth.

¹ See "East and West," by Elisée Reclus, in *Contemporary Review*, October, 1894.

CHAPTER II.

CLIMATE.

READING IN CONNECTION WITH THE LESSONS OF THIS CHAPTER.

*Works marked * are especially useful.*

*Humboldt's Cosmos.

*Island Life (especially chapters on Climate). — Wallace.

Tropical Nature. — Wallace.

Climate and Time. — Croll.

*Elementary Meteorology. — Davis.

*Eclectic Physical Geography. — Hinman.

The Ocean, Atmosphere, and Life. — Elisée Reclus.

LESSON I. — THE ELEMENTS OF CLIMATE.

Definition. — Climate is the character of the atmosphere dependent upon the condition of two primary factors, *temperature* and *moisture*. The condition of these two main elements is influenced by : 1, latitude or distance from the equator ; 2, altitude or height above the sea level ; 3, distance from the sea ; and 4, prevailing winds and ocean currents. From all of these causes arises that diversity of climate which is so marked a feature of the earth's surface. We speak accordingly of a hot or a cold, or of a dry or a moist climate. The word 'climate' is of ancient origin. It comes from a Greek verb meaning *to incline*, and was used by the ancients to signify the difference in the length of day and night, resulting from the slanting or inclination of the sun's rays in relation to the time and place. This fact was recognized

by the ancient geographer Ptolemy (127-151 A.D.), who divided the earth's surface, from the equator to the arctic circle, "into climates or parallel zones, corresponding to the successive increase of a quarter of an hour in the length of midsummer day."

Latitude or Distance from the Equator. — On those parts of the earth where the sun's rays fall more or less directly downward, the temperature of the air is raised. This is the case,

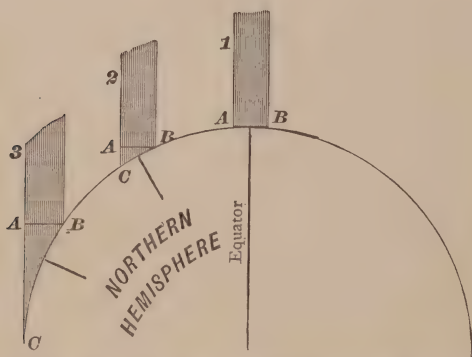


FIG. 1. — Diagram illustrating the result of vertical and slanting rays of sunlight on the earth's surface. Parallel rays (1) falling vertically are concentrated on a smaller space of surface, *A, B*, and consequently exert greater power than the same number of rays falling obliquely (2, 3), which being spread over a larger space, *C, B*, are diffused and exert less power.

as we know, in tropical countries and lands under the equator where the sun's rays are always more or less vertical. Hence the term *torrid* or *hot zone*. A vast amount of moisture is evaporated from the surface of the oceans¹ and is condensed into clouds

¹ It is estimated that the total amount of water evaporated, if condensed and evenly distributed over the earth's surface, would aggregate not far from three and one-half feet each year. Of course neither evaporation nor condensation occurs uniformly in any part of the world. In general they are greatest in equatorial latitudes.

which form a continuous belt or ring over the equatorial regions. As we go north or south from the equator we pass through regions having a temperate climate, because the sun's rays fall slantingly, and consequently with less power. Here the "change of seasons" occurs as a result of the successive changes of position of the earth in its path around the sun. As the earth in its revolution thus brings the places on its surface under different degrees of slanting rays, it follows that a certain cycle of heat and moisture must result from this changing of the relative positions of the sun and earth. In the tropics, as the sun appears to move northward or southward from the equator, the cloud belt follows, and the "rainy season" is ushered in. This occurs in lands just north of the equator in February, and reaches the tropic of Cancer about September. As the sun and its cloud belt pass south again, a second "rainy season" will occur at certain places north of the equator later in the autumn. The rainy season of tropical lands north of the equator corresponds, therefore, with spring and summer in the north temperate regions and the mid-night sun of the long arctic day. The rainy season lasts, in a general sense, from April until October. In countries south of the equator, it is then the "dry season" of the tropics and winter in the southern realm. The rainy and the summer season south of the equator corresponds to the dry season and the winter of the north, from October to April.

On account of the inclination of the axis, the curvature of the earth cuts off the rays of light from the polar regions for many weeks at one time of the year, while at another, the same cause gives these lands continuous daylight, as the sun is vertical north or south of the equator. The failure of light and heat in the polar regions throughout a greater part of the year makes them ice-locked lands of desolation.¹

¹ The seasonal changes of temperature in the temperate zones are in great part due to the different relative lengths between the day and night, as a result of the relative change of the sun's position. Thus, the more continuous sunlight in the long day of the Northern summer is a factor quite as important as the highly-inclined rays. The cold of winter is likewise the result of a lessened amount of sunlight, due to the short day and long night.

Altitude, or Height above the Sea Level. — The air of high mountain regions is much colder than that of lower levels and sea-board countries. Even at the equator eternal snow lies upon the crests of the higher ranges. A traveler climbing one of the lofty mountains in the tropics passes through the same zones of vegetation that he would meet in going north from the equator to the pole. In the hot, moist lowlands, at the mountain's base, he is surrounded by a dense forest of luxuriant, tropical growth, palms, creepers, and great climbing vines, orchids, rubber plants, gigantic fern-like forms, brilliant-colored flowers, and all the wonderful profusion of plant life that is so characteristic of tropical scenery.

Ascending the mountain slope the traveler gradually passes out of the tropical forest into the belt of hard-wood trees, first the evergreen hard woods, as the live oaks and magnolias, and finally the upper deciduous trees of the temperate zone. Still climbing, he reaches the pine belt, — the birches, larches, and pines of the north temperate zone. The cold increases as he goes upward, the trees become stunted, and finally disappear (timber line). He finds himself, at last, in an open, alpine region, like that above the northern limit of trees, the ground covered with mosses, lichens, and short grasses. Above him towers the snowy range, a region of perpetual winter, with only a few arctic wild flowers blossoming along the snow line, 15,000 feet or more above the sea. Altitude, therefore, corresponds with latitude, climate and vegetation passing through the same changes.

Though the sun's rays pour straight down upon these high mountain regions, the climate is cold because there is so little surface offered to retain the heat. In the lower regions, near the sea level, the broad surface of land and sea absorbs an immense quantity of the sun's heat, which warms the surrounding air by radiation, just as a stove warms the air of a room by radiating the heat from its whole surface. The steep and comparatively narrow mountain ranges reaching far up into the sky allow what little heat is absorbed by their surface to pass rapidly into the surrounding air, which soon dissipates it in space, and becomes increasingly

colder as the mountain mass narrows upward. For this reason, the moisture of the air falls upon the mountain summit as snow, which never melts above a certain limit (the snow line), because the conditions of temperature never change. These snow fields

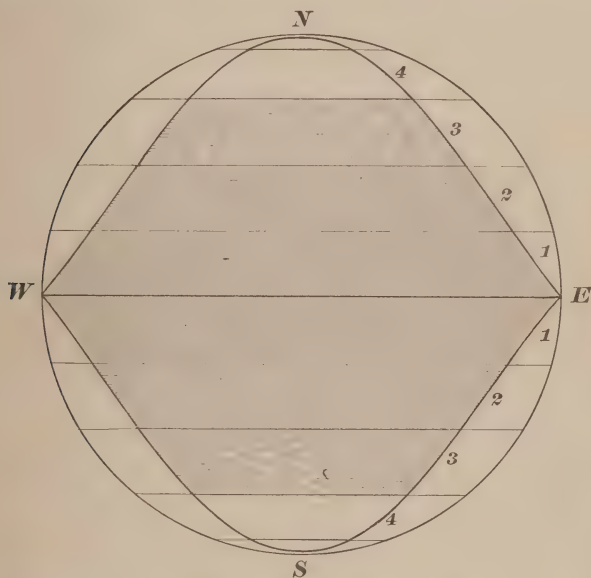


FIG. 2.— Diagram of vegetation zones of latitude and altitude. *W, E*, equator (also sea level). 1, Zone of Palms (tropical); 2, Zone of Hardwood Trees, evergreen and deciduous (sub-tropical); 3, Zone of Deciduous Trees and Pines (temperate); 4, Alpine Zone (arctic and antarctic).

and glaciers feed a multitude of torrents that spring from the mountain sides, and go roaring and foaming down to make the great tropical rivers of Asia, Africa, and South America.

Slope Exposure. — The effects of increased temperature conditions on the southern slopes of hills and mountain ranges in the northern hemisphere is conspicuous on the development and distribution of vegetation. This is often marked by an early appearance of certain species of plants in the spring, and by the higher

elevation reached by certain trees on the southern exposures. Thus on the San Francisco Mountain, Arizona, a peak nearly 13,000 feet high, a series of timber zones succeed one another, extending much higher on the southwestern than on the north-eastern slope. Rising from the desert of the Little Colorado, there is first the piñon or nut-pine belt followed by the pine, fir,

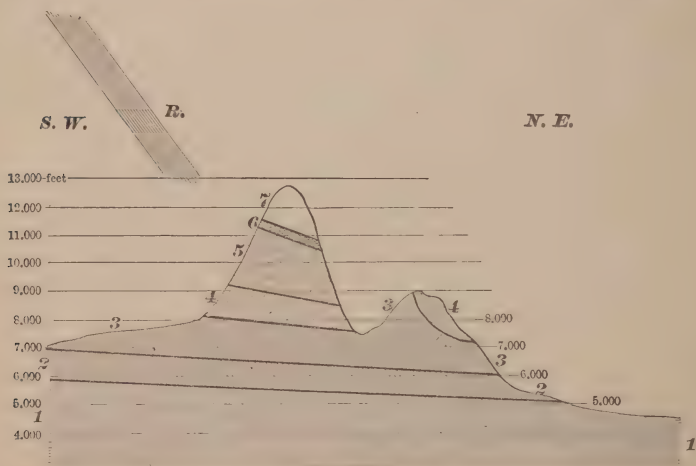


FIG. 3.— Diagram of a mountain, illustrating *Slope Exposure* (after Merriam). 1, Desert; 2, Piñon Zone; 3, Pine Zone; 4, Fir Zone; 5, Spruce Zone; 6, Timber-line Zone; 7, Alpine Zone. *R.*, relative position of sun's rays.

spruce, and timber-line belts, and culminating in an alpine zone at the summit.¹

In the southern hemisphere, from the different relative position of the sun, the northern slopes are exposed to greater warmth.

Distance from the Sea. — In the temperate zone the climate of lands bordering on the sea is less severe and more uniform in character than in the interior of the continents. This results from the fact that a great body of water like the ocean retains the sun's

¹ On "Slope Exposure" Dr. C. Hart Merriam, in Bulletin No. 3, United States Department of Agriculture (North American Fauna).

heat much longer than does the land. The surrounding air slowly receives this heat and is more continuously warm than the air over inland regions, so that in winter the climate of a seacoast is comparatively mild. In summer, for the same reason, the air over the ocean is not heated so fast as over the land, remaining cooler for a longer period, so that the climatic contrast between summer and winter is not nearly so marked in lands bordering on the sea as in those farther inland.

The interior regions of North America, Europe, and Asia suffer extreme changes of climate, the mean summer and winter differences of temperature amounting often to ninety degrees or more.

Prevailing Winds and Ocean Currents.—The direction of winds blowing over regions is an important element in determining climate. A wind blowing off the sea usually brings with it large quantities of vapor, which falls upon the land as rain, and also modifies the temperature. Winds blowing over the land are mostly dry, having been deprived of their moisture in crossing highlands and mountain ranges. This is the case with the westerly winds of the Atlantic seaboard states, blowing, as they do, over an immense area of land and high mountain ranges.

Ocean currents are even more powerful influencers of climate. The Japan current reaches far into the North Pacific, tempering the climate of the coast of Alaska and British America. Back of the mountain ranges of Alaska, a rigorous northern climate prevails, while its seaward slopes are evergreen, and its harbors always open.

The Gulf Stream of the Atlantic produces similar effects. Sweeping along the shores of the United States, it spreads north-eastwardly, warming the air over the British Isles, and far up the coast of Norway, quite to the arctic circle. On the western side of the Atlantic, the icy arctic current flowing out of Baffin's Bay and the Polar Sea makes Labrador, in the same latitude with Ireland, a land of desolation. Two types of climate are found, therefore, according to the situation of a place in reference to the above relations of land and sea, — *Oceanic* and *Continental*.

From these general considerations of climate we may proceed to examine into the nature of the elements themselves, and, by so doing, gain a clearer view of the question of climate in its relations to man.

LESSON II.—CLIMATIC ZONES.

Cause of Climatic Zones.—The unequal distribution of heat and light upon the surface of the earth, as a result of the earth's form, motion, and the inclination of its axis, determines the so-called astronomical zones. The tropical, or torrid zone, $23\frac{1}{2}^{\circ}$ north and south from the equator, is the region over some part of which the sun is always shining vertically. The temperate zones lie north and south of this central torrid girdle, while $23\frac{1}{2}^{\circ}$ from either pole mark the arctic and antarctic circles, enclosing the north and south frigid zones.

Isothermal Lines.—The astronomical zones, though of theoretical value to the geographer, are of little practical use to mankind in general, when compared with the isothermal zones. The isotherm is a line drawn through all places having the same mean annual temperature, north or south of the equator. The irregularity of the isothermal line results from the configuration of the land, its altitude, relations to the sea and to ocean currents, to prevailing winds, moisture, rainfall, etc., in fact, to all the conditions that go to make up climate. Follow, for example, the isotherm of 50° F., north, around the earth. Starting in the Pacific Ocean, west of North America, it touches the shores of the continent at Puget Sound, about 50° north latitude, but soon deflects sharply to the south, bending around the high ranges of the Rocky Mountains, and thence across the United States, passing out on the Atlantic Ocean in the neighborhood of New York. Here it meets with the Gulf Stream, and bends northward to the British Isles, slowly dropping southward through the continent of Eurasia, cutting the northern shores of the Black, Caspian, and Aral seas. Bending still further south, on the

Mongolian Plateau, it passes through Korea and into the Pacific, between the northern and southern islands of Japan. It is not to be imagined that these places, traversed by the isotherm, have identically the same character of climate. Their extremes may be widely different, and yet the mean annual temperature be the same.

The Isothermal Zones and their Oscillation. — Temperature zones bounded by isotherms, though approximating to the astronomical zones, have a far greater influence upon the destiny of races. The tropical zone lies between the isotherms of 70° F., north, and 70° F., south latitude. The isotherm of 70° north follows an irregular line parallel to and somewhat north of the tropic of Cancer. It bends sharply north around the head of the Gulf of California; skirts the Gulf Coast of the United States; bends northward with the Gulf Stream in the Atlantic; passes through the Canary Islands; crosses Africa along the northern edge of the Sahara; continues through Persia, and sweeping southward along the Himalayas touches the tropic of Cancer at the island of Formosa. The isotherm of 70° south crosses the tropic of Capricorn under the influences of the cold Humboldt current off the western coast of South America; slopes southward across that continent into the Atlantic, where it cuts the tropic twice by a northward curve; crosses Africa north of the Cape Colony, and bending northward again touches Capricorn in Central Australia. The thermal equator, in the Pacific, lies south of the true or astronomical equator, but sweeps northward along the northern shore of South America; dips southward in the Atlantic, touching the equator, and bending north enters Africa near the mouth of the Niger, and passes into the Indian Ocean at Cape Guardafui. Sweeping south, it cuts the southern end of Hindustan and crosses the Malay Peninsula and Borneo. On either side of the tropical zone are the temperate zones, bounded north and south by the isotherms of 30° F. The northern isotherm of 30° F. bends northward in the Atlantic considerably beyond the arctic circle, owing to the influence of the Gulf Stream, but is otherwise far to the south in the great continental areas.

By far the most interesting and important factor in these isothermal lines and zones is their annual oscillation with the sun. Thus in July, when the sun has moved over Cancer, the isotherm of 70° north moves northward into British America, the North Atlantic, Central Europe, and Siberia, pushing the conditions of the temperate zone into the polar realm, and causing the brief arctic summer with its burst of alpine blossoms, its swarms of insect life, and flights of breeding birds. Tropical conditions are, at the same time, carried north into the temperate lands.

Temperature Control of Distribution of Life.—Heat is the direct stimulus of the reproductive and vegetative functions of animal and plant life. It is, therefore, the controlling factor of distribution. It has been found that 42.8° F. is the initial temperature required to start the dormant activities of plant life (germination of seeds, growth, and flowering). The northward movement of this isotherm marks the true advent of spring in the different regions of the northern hemisphere. The northward distribution of many species of animals and plants does not conform to the annual isotherm, but depends upon the total quantity of heat; *i.e.*, the sum of the daily rise of temperature over and above 42.8° F. throughout the period of reproductive activity, since each particular species requires a certain definite and constant quantity of heat in order to accomplish its reproductive function. For example, the daily temperatures in a lowland district throughout the three summer months may not rise to any considerable height, and yet the sum will be the same as in a highland region where higher daily temperatures exist for a much shorter space of time, — say one month. The species of animal or plant whose “heat constant” corresponds to this sum of the temperatures would range throughout both districts, but would reproduce more quickly in the shorter summer region. The southern limit of most species corresponds to the mean annual isotherm.¹

¹ See “Laws of Temperature Control of the Geographic Distribution of Terrestrial Animals and Plants,” by Dr. C. Hart Merriam, *National Geographic Magazine*, Vol. VI., 1894, pp. 229–238.

As the isotherms thus oscillate north and south with the sun, we see the cause of the increase and decrease of temperature over the earth, bringing with it the various seasonal changes. Though the greater or less obliquity of the sun's rays is the essential factor, the irregular curves of the isotherms show how vastly important are physical features of land and sea in determining climate.¹

LESSON III. — WINDS, OCEAN CURRENTS, AND RAINFALL.

Primary Cause of Winds. — The atmosphere is in a state of unstable equilibrium, heat and moisture being unequally distributed. It is losing or gaining heat in different regions, since the surface of the earth is heated unequally by the rays of the sun. A portion of land or sea heated above the temperature of the surrounding territory warms, by radiation, the overlying air, causing it to expand. This warm, expanded air has a greater capacity for holding vapor than when cooler and more dense. In consequence, it eagerly takes up vapor by the process of evaporation from the surface of the ocean or from the waters of the land. It thus becomes *lighter* than the surrounding cooler air, since water vapor is lighter than air itself, and takes the place of a certain proportion of air in any given volume.

In the process of expansion, this warm, vapor-laden air pushes the cooler air immediately above it against the whole mass of the overlying atmosphere, causing an increase of pressure in the air

¹ An isothermal line is to be regarded, not as a *fixed* line of mean annual temperature, but as one that moves north and south in relation to the increase and decrease of heat over the earth's surface from the greater or less slant of the sun's rays. Thus the coast of Alaska, the Central United States, the Lower Lake Region, Newfoundland, the Scandinavian Peninsula, Central Russia, Mongolia, Korea, and Northern Japan have the mean January temperature of 20° F., while in July the temperature of these places does not correspond in any way. For instance, in July the coast of Alaska has the same mean temperature as Northern Siberia, and the July isotherm of the Central United States passes through Northern Africa. The annual isotherm is a line drawn to represent the average sum of the mean monthly temperatures taken from observations covering a period of several years.

thus squeezed which becomes denser and heavier in consequence. If we can imagine this expanded volume of air pushing up in the shape of a mound, then we can see how the dense and heavy air above will slide down the slopes of the mound on all sides toward surrounding areas of less pressure, simply because it is heavier air and is under the influence of gravity. This movement of the air is a *wind* blowing some distance above the surface of the earth. Immediately over the surface, however, where the heated and expanded air is much lighter than the cooler and denser surface

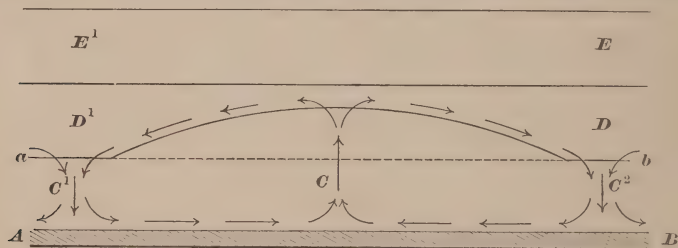


FIG. 4. — Diagram of winds. *A, B*, surface of the earth; *C*, heated portion of air, expanding upward along line *a, b*; *D, D¹*, level of cooler air, compressed by being squeezed between *a, b*, and *E, E¹*, the upper atmosphere; *C, C¹, C²*, calm areas. Arrows indicate direction of winds.

air surrounding it, a movement of air takes place on all sides from these surrounding denser areas toward the central heated portion. This movement is felt as a sensible *wind* or *breeze* blowing over the surface of the land or sea. Its direction is opposite to that of the upper currents of air. There is no appreciable movement in the warm, expanded area, as the wind, rushing in on all sides, rises as an up-draught just as in the case of a fireplace and its chimney. It is therefore an area of *calm*. In the surrounding areas of high pressure there is, likewise, no horizontal movement, as the upper, heavier air is always sinking down and taking the place of the surface wind that flows out toward the center.

As the barometer indicates the pressure of the atmosphere under its various conditions, we know that the warm, moist, and expanding air is an *area of low pressure* or *low barometer*, while

the surrounding heavier, drier, and cooler air constitutes an *area of high pressure* or *high barometer*. A law governing the movement of the atmosphere can thus be formulated: *Winds always blow spirally, from all quarters, into low-pressure areas.*

Effect of the Earth's Rotation on the Direction of Winds. — In the northern hemisphere a wind, blowing from latitudes near the equator toward the polar regions, is successively deflected from its original due north direction by the inertia of the earth's rotation, carrying the wind, as it blows, more and more to the east. This imparts a *whirling* motion to the wind as it sweeps around to enter the polar area of low pressure. A wind blowing due south on a meridian in high latitudes appears to turn westward as it approaches the equator by being carried eastward on the same meridian. So a wind blowing due west or due east on a given parallel appears to turn toward the north or south, respectively, under the influence of rotation. (See Diagram.) Winds in the northern hemisphere are thus deflected from their true course by being carried continually eastward on the meridian at which they started. Thus, from the polar area, as a point of observation, winds are turned or deflected toward the *right*. An originally south wind thus becomes southwest; a north wind, northeast; a west wind, northwest; and an east wind, southeast, in the direction *from* which each blows. In the effort made by these winds to reach any low-pressure area, they struggle, as it were, against this deflective movement, and keep curving around in an opposite direction, or toward the left. This produces a *whirl* about the center of low pressure. Any low-pressure area in the northern hemisphere will thus have the winds describing arcs about it from right to left, or against the hand movement of a watch. The reverse of this is true in the southern hemisphere, taking the south pole as the center of observation. Thus, the winds will be deflected to the left, and will describe arcs from left to right, or with the hands of a watch, as they advance into the area of low pressure. As a result of this law, first pointed out by Professor Buys Ballot of Utrecht, if an observer in the northern hemisphere stands with his back to the

wind, the center of low pressure will always be to his left, while in the southern hemisphere it will be to his right.

Constant and Periodic Winds.—The same movement of air that takes place in any local area occurs on a grand scale between the heated equatorial region as an area of low pressure and regions of high pressure on either side. A constant movement of cold

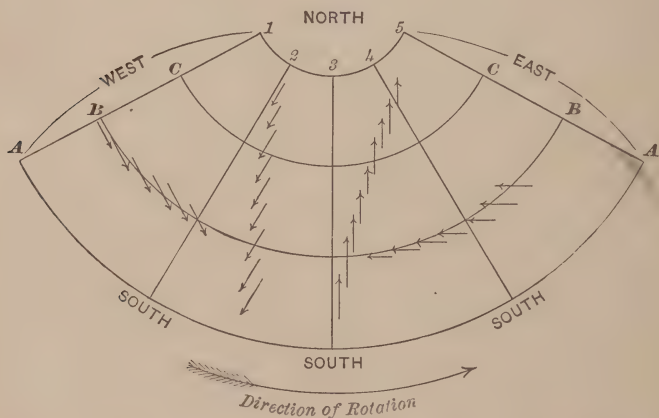


FIG. 5.—Diagram of a section of Northern Hemisphere, illustrating the effect of the earth's rotation in deflecting winds. (Observer over north pole.) A wind from the south blowing due north on meridian 3, is carried successively eastward by the earth's rotation, and is apparently deflected or turned to the right, as it advances, appearing as a southwest wind on reaching the position of meridian 4 (above parallel C). So a wind blowing due south on meridian 2 is carried eastward and apparently turned toward the right, thus becoming a northeast wind. A west wind on parallel B, at meridian 1, is apparently turned to the right, as the meridian advances eastward along the parallel, owing to the curvature of the earth, and becomes a northwest wind on reaching the position of meridian 2. In like manner an east wind on parallel B, between meridians 3 and 4, is apparently turned to the right, and becomes a southeast wind.

and heavy air blows as surface winds from about latitude 30° north and south toward the equatorial belt of low pressure. These are known as the *trade winds*. Being deflected from their due north and south course by the rotation of the earth, they appear as

northeast and southeast winds. The warm, vapor-laden air of the equatorial region, rising as an upward-flowing current, constitutes a *belt of calms*. In the higher, denser levels, this air becomes cooled, and flows out on each side toward the northeast and southeast as upper, countercurrents of wind known as the *counter-trades*. In the tropical belts of high pressure on either side (about 30° north and south) these cooled "counter-trades" descend to the surface, and take the place of the outflowing "trades" moving toward the equator. Calm belts are thus formed near the northern and southern limits of the tropics. From these high-pressure calm belts the air likewise flows out in the opposite direction as a surface wind blowing toward the low-pressure polar area in each hemisphere. The low pressure of the air in the polar regions results from the depressing effects of the whirling motion of the winds, for winds approaching the poles move in ever-narrowing circles, from being turned aside by the rotation of the earth. The air in the polar area is held away by the centrifugal action of the whirl, like water about the vortex of a whirlpool, and is banked up, as it were, in the tropical calm belt, producing its high pressure. A countercurrent flows out from each pole toward the tropical belts of high pressure.

In the northern hemisphere, from the preponderance of the land masses, these winds become much more variable in character, though westerly winds predominate from the great circumpolar circulation of air caused by the earth's rotation. Further disturbances are induced by the unequal heating of land and water, which gives rise to storms, sudden changes of weather, and to periodic winds blowing on or off shore. Of these periodic winds are the sea and land breezes of coasts, as a result of the difference in the day and night temperature of the air over the land and the water. On a larger scale are the *monsoons* of the Indian Ocean and coasts of South America, which blow steadily for half the year in one direction, and then blow in an opposite direction for the other half. The monsoons are caused by the change of the sun's position in the heavens, bringing vertical rays over part of the great

land mass, thus raising the temperature of the air, and causing a strong wind to set in from the ocean. Between April and October, when the sun is almost directly over Southern Asia, that region becomes an area of low pressure, and the moisture-laden monsoon blows steadily and with great force from the southwest.

Storms.—The rush of the winds around the center of low pressure produces a whirling mass of air, somewhat dish-shaped, its center of lowest pressure being surrounded by belts of increasingly higher pressure toward the circumference from the development of centrifugal force incident to the whirl. These belts of pressure are termed *isobars*, and the difference between them is the *gradient*, or slope, from higher to lower pressure levels. On reaching the center the wind rises as an up-going current, which flows out above on all sides. These circling storms of wind are called *cyclones*, and are usually accompanied by clouds and rain. The storm center is an area of calm, of low barometer, and small precipitation, surrounded by an area of heavy cloud sheets and copious rainfall. The nimbus, or rain cloud, extends about it on all sides, fringed by the lofty streamers of cirrus clouds, “mare’s tails” and “mackerel scales,” the threatening sky of approaching foul weather. The storm center has a forward movement under the influence of the strongest wind, and travels with varying velocity. The cyclonic storms of the northern hemisphere belong to two distinct classes which possess quite different features though having the common characteristic of winds circling from right to left. Most of our great winter storms belong to the class known as *extra-tropical cyclones*, and are due to local eddies of low pressure in the great circumpolar system of air currents that form the prevailing westerly winds of the north temperate zone. The other class are known as *tropical cyclones*, and are generated in the ocean area of sub-equatorial regions from the unequal heating of masses of air. The central calm or “eye” of these storms is more distinctly marked, their winds are stronger, and the entire disturbance is usually of less extent than in the extra-tropical cyclones. They move at first northwestward within the tropics,

but on reaching the temperate zone turn to the northeast, thus describing a parabolic curve. Tropical cyclones are of frequent occurrence in our latitude during the late summer and early fall as a result of the northward position of the equatorial calm belt

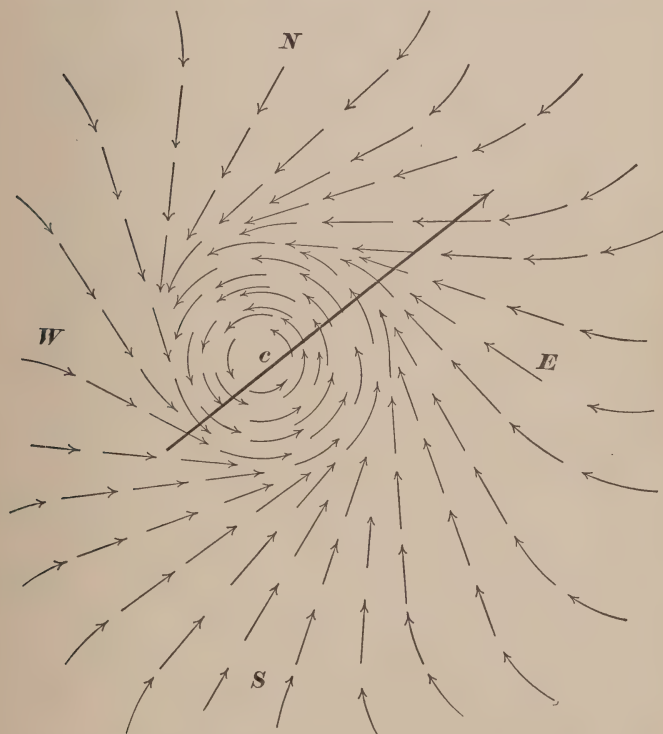


FIG. 6.—Diagram of Cyclonic Movement in Northern Hemisphere. *c*, area of low pressure, or storm center. The large arrow, pointing northeast, indicates the track of the cyclone under the impulse of the strongest winds. The small arrows fly with the inblowing winds from right to left, or against the hands of a watch.

or "doldrums" at that time, which brings masses of highly heated air into contact with the overlying cooler air along the tropical border, thus causing a convectional disturbance. The typhoons

and hurricanes of the East and West Indies belong to this class of storms.¹ A cyclonic storm may embrace an area of several hundred to a thousand or more miles in diameter. As it advances, it grows in dimensions from the increase of low pressure produced by the centrifugal force of the whirling winds. The storm dies away as the result of friction; more air entering the center than can escape at the top causes the whirl to finally lessen in velocity, and a higher pressure is thus established. High-pressure areas have the air flowing *out* from them as a whirl of winds in the opposite direction; *i.e.* from left to right. These outward-whirling areas are known as *anti-cyclones*. They form the high-pressure areas surrounding extra-tropical cyclones. Their winds, at first cold, grow increasingly warmer as they approach the low-pressure area, and are consequently dry, and accompanied by clear or fair weather. The so-called *hot* and *cold waves* are anti-cyclones.

It has been observed that the most constant areas of low pressure in the northern hemisphere are distributed as follows: To the west-southwest of the Great Lakes in the United States; the Gulf of St. Lawrence; the Mid-Atlantic area; an area southwest of Greenland; one southwest of Iceland, which is the most important of all; and one over a portion of Northwestern Europe. In these areas nearly all of the great northern storms are bred, and the direction of their path is governed by the surrounding conditions of pressure. For instance, the high winter pressure over Northwestern America drives a storm, developing in the Rocky Mountain region, eastward across the United States to the Atlantic seaboard. Easterly winds, bringing increased cloudiness and rain from the ocean, blow at first toward the advancing center of depression, which has no sooner passed over a given locality than the wind veers to the west, and clearing weather followed by a "cold wave" from the area of high pressure marks the westerly half of the cyclone. The peculiar characteristics of the winter and summer climates in Europe and the United States are largely the result of the tracks taken by cyclones under the surrounding conditions of

¹ See Davis, "Elementary Meteorology," pp. 183-208.

atmospheric pressure. These storms sometimes travel from the Rocky Mountain region far into the Siberian plain, beyond the Ural Mountains.

The term *weather* relates to the local conditions of temperature and moisture at any given time and place. We speak of hot or cold, wet or dry, fair or foul, weather in any locality at any time. It is the condition of the atmosphere of a place from day to day. Places in the path of an advancing storm have *increased temperature and humidity* as characteristics of weather resulting from the southerly and easterly winds blowing from warmer into colder areas, which causes increased condensation of their moisture, and the consequent liberation of a large amount of latent heat. The westerly half or "wake" of the storm is characterized by *clear and cold, or cool weather, with dryness or decrease of humidity*, because the north and northwest winds blowing from colder into warmer areas evaporate, or take up moisture, in increasing quantity.

Thunderstorms are the result of local convectional disturbances of the atmosphere. They advance broadside across the country, usually toward the east in the temperate zone under the influence of the prevailing westerly winds, with a heavy trail of rain which is preceded by a violent outrushing squall of cool wind that sweeps a cloud of dust before it. The rainless sandstorms called *simooms* of the Sahara and Arabian deserts are of a similar nature. The so-called "cloud-bursts" of our dry Western Plains, the "pamperos" of the Argentine Republic, the "dust-storms" of the Indus region in India, the violent thunderstorms of equatorial Africa and the mid-ocean squalls of the doldrums belong to this same class. Tornadoes are supposed to be due to the formation of a narrow and violent whirl of air generated within the larger whirl of a gentle cyclonic movement. Somewhere in this area the air, becoming highly heated, forms a focus of low pressure, which causes the gentle whirling winds about it to rush in with terrific and destructive force. The immense amount of vapor formed is condensed into a heavy, black cloud, which is twisted by the wind into its characteristic funnel-shaped form. The waterspout is a

similar phenomenon, occurring at sea. The air over sandy deserts and dusty roads becomes superheated in places, and rises, while the surrounding air rushes in, sweeping the sand and dust along in a whirling column. This whirlwind is not a true cyclone; it depends upon a rotary force developed by the intruding air.¹

Ocean Currents. — The surface water of the ocean is thrown into a system of great currents by the force and direction of the prevailing winds. In both the Atlantic and Pacific a great equatorial current flows westward under the influence of the northeast and southeast trades. The position of the land masses in relation to the oceans, and the force and direction of the prevailing winds in different regions, modifies the direction of these currents and gives to each great body of water its characteristic circulation. The unequal distribution of heat over different parts of the ocean surface produces a vertical movement of the water. When a volume of water gets colder, it becomes heavier and, sinking down, displaces the deeper layers, which rise toward the surface. These vertical movements tend to equalize the temperature of the ocean over large areas.

A vast quantity of floating fucus and other seaweeds occurs over wide areas of the ocean in the regions of the calms. This is the so-called Sargasso Sea.² That it is due to the effect of calm conditions is borne out by the fact that similar though smaller areas of floating seaweed occur along the Pacific coast in the lee of protected shores. Many marine animals find a home among the floating weeds of the Sargasso Sea, especially species of crustacea like the crabs and their allies.

Rainfall. — The primary cause of a fall of rain is the lowering of the temperature of the air below the dew point. This is effected chiefly through the influence of winds. A wind blowing over any considerable extent of ocean gathers up a large quantity of moisture, and whether this falls as rain or not depends largely

¹ See Davis, "Elementary Meteorology," pp. 36, 201, 248-284.

² It was the floating seaweed of this Sargasso Sea that led Columbus to believe that land was not far distant.

on the condition of the air of the region into which it flows. If it move into a warmer and drier region, it will take up more moisture rather than precipitate it. When a moisture-laden wind blows into a cold region, a fall of rain is the result, because the temperature of the air falls below the point of saturation. A bank of air hangs over the land which is stiller than that over the sea, because its velocity has been diminished by contact with the land surface. A wind off the sea blowing against this bank of air is forced to rise, in doing which it expands, thereby losing heat, and precipitating its moisture in showers of rain. For the same reason a moisture-laden wind blowing over a range of mountains precipitates its moisture not only by being cooled, but, more copiously still, by expanding in rising to higher levels. This same wind after passing the crest of the range will blow down its leeward slopes as a dry wind; dry, not only by loss of vapor, but because it enters lower, warmer levels of air under increasing pressure.

The expansion of a volume of moisture-laden air in rising to higher levels is marked by a distinct loss of sensible heat which is said to become latent. The reason for this is, that in expanding, a certain amount of work is done in pushing aside the surrounding heavier atmosphere, and the heat originally present is transformed into expansive energy, and so is apparently lost for the time. But the lowering of temperature by this change of energy finally chills the mass of air to its point of saturation, and brings about condensation and the formation of cloud, which is accompanied by a distinct gain of sensible heat.¹

The formation of cloud, fog, and rain may be due in part to the presence of minute *dust motes*,² an inconceivable number of which are always floating in the air. Each vapor particle, in forming,

¹ The term *adiabatic* is used to express this change of energy without the passage of heat to or from the air.—Davis, "Elementary Meteorology," p. 38.

² Mr. J. Aitken. See "Dust" by J. G. McPherson, *Popular Science Monthly*, Vol. xl. 251. This theory, though borne out by laboratory experiments, does not seem to hold when applied to natural conditions. The idea that rain is caused by the coalescence of vapor particles is not yet disproved. See Davis, "Elementary Meteorology," p. 159.

collects about a dust mote as nucleus. If these dust motes be crowded and in excess of the amount of vapor, the entire body of vapor is divided up into very small particles about each mote, and, being comparatively light, the whole mass hangs together as *fog* or *cloud*. When, however, the dust motes are fewer and more scattered, a larger amount of vapor collects about each mote, and the particles thus becoming heavier will fall to the earth as *drops of rain*. Under the same condition, but if the temperature of the cloud and the air beneath it be below the freezing point, the watery globules become frozen into ice crystals, and drift down to the earth as *snowflakes*. Were it not for this floating dust, the moisture of the air would be precipitated only in the form of dew, and objects on the surface would be in a continual state of dampness.

Distribution of Rainfall. — From what we have observed it follows that rain is very unequally distributed over the earth's surface. The distribution of the land, the position of mountain ranges and deserts, the prevalence of certain winds, — each exerts an important influence on the distribution of rain. The equatorial calm belt is a belt of constant rains owing to the enormous evaporation and subsequent precipitation of vapor taking place under the direct rays of the sun. Hence the cloud ring, or belt, which follows the oscillations of the isotherms, and brings the periodical rains of the tropics. North of the tropics is the region of variable rains as it is of variable winds, and the same is true of southern latitudes. The great number of storms and characteristic "changes of weather" in the North Temperate Zone are largely due to the chilling of the moisture-laden anti-trades on their journey toward the polar circulation.

The heaviest rainfall in the world is in the region of the Bay of Bengal, when the southwest monsoon, loaded with warm vapors from the Indian Ocean, strikes the Khasia hills. An annual fall of 600 inches, or about fifty feet, is not uncommon. The great tropical forest regions of Africa and South America are largely the result of the heavy rainfall produced by winds from the Atlantic,

precipitating their moisture under the influence of the high mountain slopes of East Africa and the Andes.

The great desert belts of the world are rainless regions, and result from the dry winds which blow over them, deprived of moisture by the surrounding highlands. The northeasterly stretch of desert across Africa and Asia from the Atlantic to the Pacific; the desert plains of the Great Basin in North America east of the Sierra Nevada; and the deserts of Argentina, Peru, and Chile, in the Andes, are examples of rainless regions.

LESSON IV.—INFLUENCE OF CLIMATE ON MAN.

Physiological Effect of Climate and Food.—Color is a normal product of the animal organism, its probable source being the coloring matter of the blood. A surplus of this may be thrown off as so much waste material in the intricate processes of nutrition which take place throughout the various tissues of the living body. A large portion of this surplus pigment finds lodgment in the layers of the skin, imparting to it a characteristic color. The liver is undoubtedly largely concerned in the elaboration of this coloring matter from the blood, and we are not surprised to find important modifications of color as a result of special climatic conditions.

Two broad classes of mankind may be recognized as to their shade of coloring,—the *light* and the *dark*. These vary from the deep chocolate brown or black of the natives of Western Africa to the fair-haired, white-skinned peoples of Northern Europe. Between these extremes are all shades of color, the medium shade being seen best in the yellow, olive, or copper color of the inhabitants of Central Asia and North America.

This brings us to the question of the geographical distribution of human color, and an approach to its solution, if such a thing be possible in the present state of knowledge. Under a hot, moist climate, the liver is more normally congested, if we can

use such an expression, from the dilatation of the blood vessels and general relaxation induced, through the nervous system, by the action of the external conditions of heat and moisture. This increased blood supply to the organ means an increased amount of coloring matter, and the question of its ultimate disposal.¹ This possible cause of the dark coloring of the skin is borne out by the fact that not only is man darkly colored in the hot, humid forests of tropical Western Africa and South America, but animal life in general presents a wonderful development of color. Cold, dry air has a tendency to contract the blood vessels, and thus diminish the production of color. Exposure to sunlight has also its peculiar effect upon the skin, producing what we know as 'sunburn,' or 'tan.'

Taking a broad survey of the distribution of color, we see that the darkest peoples are those inhabiting tropical forest regions where heat and moisture are most pronounced. The white race is disposed in two strongly contrasted groups, — the *light* and the *dark* whites. The former are of northern distribution, as the old Saxons, and the inhabitants of the Scandinavian Peninsula. The dark whites are essentially southern, natives of the Mediterranean region, where moisture and temperature are more equally distributed — cloudy skies alternating with bright sunlight and a semi-tropical warmth tempered down by cool mountain winds and sea breezes.² The inland or continental climate, dominating the great land masses of Central Asia and North America, has a peculiar drying effect upon the skin with a medium production of color through the action of the liver. The inhabitants of these great areas are uniformly of an olive or coppery hue. A radical change of color is not effected, as we very well know, by a change of residence, even through many generations. The African negro

¹ In confirmation of this statement is the fact that *abscess of the liver* is an extremely rare disease outside of the tropics. The discoloration of the skin, or *jaundice*, from an excess of bile pigment in the blood, also bears out this idea.

² Dark colored peoples are found among the Hindus, members of the white race, who for ages have been subjected to the influence of tropical conditions of a most intense character. *Varna*, the Hindu word for "caste," means *color*.

in the United States illustrates this fact. Man's color to-day is the result of climatic and other effects extending over vast ages. This, like all other animal characteristics, only became a fixed trait through the lapse of time. The color and character of the eyes and hair, and the modifications of the bones of the skull, have likewise resulted from operations which began thousands of generations back, even in the dawn of the prehistoric. The varying shades of color throughout the peoples of the white race to-day have resulted from ages of widespread intermarriage.

With such a physical basis to operate on, *sexual selection* very probably stepped in at a remote period, and became a potent cause in fixing color in the various racial types. In the same way the other race characteristics must have become fixed, partly through the intervention of sexual selection, but also largely from the physical nature of the environment acting directly upon the organism.

The effect of climatic and geographical conditions upon temperament and mental characteristics has undoubtedly played no small part in the development of races and peoples. This fact must underlie the literature and religion of a nation to a greater or less extent, imparting to each a certain tone and cast of expression. The Hindu, impressed by the mighty forms and forces of surrounding nature, — the awful gloom of the Himalayas, the vast solitudes of tropical forests, the unmastered floods of the great rivers, death everywhere and in every shape, — developed a profound philosophy, a nature worship tinged with the melancholy of future oblivion. Out of the harsh, inhuman desert, where nature seemed to starve man, came the Mohammedan idea of eternal bliss, an unending dream of sensuous delight attained by the faithful after the privations of a desert life. The varied relations of man with man have in like manner wrought their effects on human thought. Thus, the Hebrew conception of a God of justice, meting out good and evil, may have arisen from years of oppression and bondage at a remote period. The North American Indian, starving with cold and hunger, or reveling in abundance, worships the munificent bestower of maize, and

meat, and the warm sunshine. So, man in all times and places has worshiped that which made the strongest impression on him.

Food has operated along the same lines as climate. Vegetable food stuffs, as starch-filled roots and fruits of various kinds, form the natural diet of the tropics, requiring less concentrated work by the liver, and producing less bodily heat than a diet of animal matter. The British in India, and the white man anywhere in the tropics, knows by sad experience the dangerous effects of a long-continued meat diet. On the other hand, the Eskimo hunter and the native of Northern Siberia gorges himself to the full with fish oil and walrus blubber, to make his body glow like a furnace with the burning up of the fat.

In hot climates the bodily activities are lessened because less internal heat is required to maintain the blood at its normal standard. Tissue changes, including the processes of nutrition and oxidation, go on at a much slower pace than in cold climates, where a great demand is made upon the heat-producing powers of the body. Heated air draws the blood to the surface and the increased amount of blood in the skin stimulates the sweat glands to greater activity. The rapid evaporation of the sweat cools the surface and consequently the blood flowing immediately beneath its outer layers. With the slower activities of the body there is a diminished excretion or riddance of waste matter from the tissues which tends to clog the system and thus produces that lassitude and torpor which is so characteristic of a tropical life. The reverse of this is true in cold climates, where increased bodily activity means increased waste and its rapid removal through the lungs and kidneys. Cold air drives the blood from the surface and the production of sweat is diminished.

Increased moisture of the air lessens the rate of evaporation from the surface of the body, and thus tends to elevate the temperature of the blood. We are all familiar with the disagreeable feeling resulting from this in warm, damp weather, especially before a coming storm.

Mountain Climates. — The climate of high altitudes has a pecul-

ially bracing effect upon the bodily and mental conditions, for the following reasons: (1) There is *less moisture* and *less pressure*; consequently the air of mountain regions is *dry*¹ and *rare*. (2) Constant and rapid movement of the particles of air in the *blowing of strong winds* increases evaporation. (3) The character of the ground, elevated above the general surface and often steeply inclined, produces a *cold air* from rapid radiation of the sun's heat, while at the same time there is a *broader expanse of sunlight*. There is also less *dust* and *germs* floating in the air of higher altitudes. (4) The presence of *ozone* in large amount is an important element in the effect of mountain climates. Ozone is a more active state of oxygen resulting from certain peculiar electrical conditions of the atmosphere. It affects the system by producing more rapid tissue changes.

On the threshold of inquiry, we are thus brought face to face with some of the profound problems of human life and development. We have a glimpse, as it were, through dark doors of some of the possible causes which have been at work moulding and making the different types of men. The increased vigor of a mountain life or a life in the North Temperate Realm is in contrast with the life of the lowlands, the inhabitants of tropical seacoasts, or of the forests of the torrid zone. All this hints at more than broad features of race distribution. The origin of temperament, diversity, genius, is hidden in the deeper science of Geography.²

NOTE.—The density of population in limited areas of land has undoubtedly played a very important part in developing centers of civilization by increasing the struggle for existence. This increased struggle has often outweighed the retarding effects of climate by stimulating the inventive faculties. This may have been the case with the Chinese in their humid river valleys, the Japanese in their island home, the Indian civilization in a tropical peninsula, the Egyptian and Mesopotamian civilizations surrounded by the desert, and with many other ancient civilized communities.

¹ This, of course, does not apply to the windward slopes of mountain ranges situated near the sea, where the moisture and rainfall are often excessive.

² See "The Man of Genius," by C. Lombroso, Part II., Contemporary Science Series. In this interesting work the author traces the relations of men of genius to meteorological, climatic, and orographic influences, as well as to the effects of race, heredity, and the opportunities of civilization.

CHAPTER III.

PLANTS WHICH HAVE AFFECTED MAN.



READING IN CONNECTION WITH THIS CHAPTER.

The Tropical World. — Hartwig.

*Origin of Cultivated Plants. — De Candolle (International Science Series).



LESSON I. — TEA AND COFFEE.

The Tea Plant. — At least one-half of the population of the earth to-day are tea drinkers. This beverage, which gladdens the hearts of so many different peoples throughout the world, is made from the leaves of a low, bushy, evergreen shrub, not more than five feet in height, growing in warm, moist climates. The flower-buds, which appear in the crotch of a leaf, open later into a cluster of two or three white, mildly fragrant blossoms. A light, easily broken, but deep soil, a warm temperature, and an abundance of moisture are essential to the healthy growth of the tea plant.

The cultivation of the plant is limited to regions presenting an abundant rainfall and a more or less uniform, *tropical climate*. These conditions are found united in the countries of Eastern and

Southeastern Asia, — China, Japan, and the lands bordering on the Indian Ocean.

The Japan Current. — The Pacific Ocean washes the eastern shores of Asia with a warm stream, the *Japan current*, flowing north from the equatorial regions. This Japan current, called Kuro Siwo or *Black Stream* by the Japanese from the dark blue color of its water, warms the air of the regions into which it flows, and produces an abundance of moisture.

Physical Features of the Land and their Effect. — From the southeastern shores of Asia, the warm, vapor-laden air blows over the land. This sooner or later strikes the eastern mountain spurs of the Himalaya, Kuen Luen, and other ranges that everywhere bar off the low-lying coast countries from the high central plateau of the continent. Driven up these eastern slopes, the warm air expands, and, becoming chilled, precipitates its clouds of vapor in *showers of rain*. The rain soaks through the loose soil, but comes to the surface again in various places as *springs*. Little rills trickle from these springs down the mountain slopes, joining one another to form the larger brooks that feed the great rivers of China, — the Yang-tse-kiang and Hoang-Ho, which flow through fertile and densely populated valleys, carrying the water back to the ocean.

Geographical Range of Tea Cultivation. — Tea is cultivated in Japan as far north as latitude 39°, on the same parallel as Washington, D.C. Japan is a group of islands lying off the eastern shores of Asia, washed on all sides by the warm waters of the great Kuro Siwo. Tropical conditions of climate are carried beyond the mere geographical limits of the tropics by this bearer of heat and moisture. At the present day tea is cultivated in Java, Ceylon, India, Australia, Natal on the east coast of South Africa, and in Brazil; but China, Assam, and Japan are the great tea producing countries of the world.

History and Commerce. — Tea has been cultivated in China from the remotest antiquity. So long has it been under cultivation that it has never been known to occur in a wild state within

the period of history. A wild form reaching the size of a tree in the jungles of Assam is believed to be the original stock from which the tea plant sprang. Some curious legends give the plant as coming from the West into China.

Tea was carried into Japan by a priest about the beginning of the thirteenth century, and sown in the southern island, the cultivation spreading north to its present limit. Marco Polo, the great traveler in eastern lands, makes no mention of tea, and it was not until the year 1517, when the Portuguese navigators first opened trade with China, that tea was brought into Europe. Little was known about it, however, until the Dutch traders of the seventeenth century learned the habit of tea drinking from the Chinese, a habit which has since spread among all the civilized peoples of the earth.

The tea gardens of China are generally situated on hill slopes, where the soil is loose, deep, and not easily washed by the rains. The leaves are picked four times during the year: early in April, early in May, in July, and again in August or September. The leaves are dried and roasted, a different process of handling giving rise to the two varieties known as 'black' tea and 'green' tea. Tea leaves compressed into blocks form 'brick tea,' much used by the inhabitants of Central Asia, who eat it as a vegetable. Russia imports vast quantities of this 'brick tea' through the Kalgan Gate of the Great Wall of China.

The present consumption of tea throughout the world at large probably amounts to some 2,500 millions of pounds yearly, 2,000 millions of which, it has been estimated, are consumed in China alone.

Coffee. — The coffee plant is an evergreen tree growing wild in Abyssinia, the Soudan, and the coasts of Mozambique and Guinea. It is found in well watered mountainous regions, from 1000 to 4000 feet above the sea level, and within the tropics. The white, fragrant flowers grow in clusters from the crotches of the leaves. The fruit is a berry, round, fleshy, and much like a cherry in appearance. Each berry contains two hard-coated seeds, the familiar coffee beans of commerce.

Geographical Conditions of Coffee Growth. — The great equatorial stream flowing westwardly in the Pacific splits into two streams, one of which, the Japan current, we have already noticed. The other stream flows southward, and part of it enters the Indian Ocean through Torres Strait, between Australia and the island of New Guinea. Flowing across the Indian Ocean, it sweeps south along the African coast as the *Mozambique current*, bringing like its twin brother, the Japan current, volumes of warm vapor which fall in abundant showers of rain on the highlands of East Africa. This region is the original home of the coffee tree.

History and Commerce. — The berries of the wild coffee were probably gathered by the inhabitants of Abyssinia ages before the thought of the cultivation of the plant occurred to any one. It evidently did not reach neighboring countries for a long time, as the Crusaders had no knowledge of it. Its use, as a beverage, appears to have spread from Abyssinia into Arabia early in the fifteenth century. The coffee plant was probably first cultivated in Arabia, the coffee-drinking habit slowly spreading from that country into Egypt, Persia, and Turkey.¹

The use of coffee came into Europe from the East in the seventeenth century. In 1690 the Dutch governor of the East Indies obtained a few seeds from Arabian traders and planted them in Java. This was the beginning of the great Java coffee cultivation. One of the first Java plants was sent to Holland and planted in the Botanic Garden at Amsterdam. A few young plants from the seeds of this one were sent later to the Dutch possessions of Surinam or Guiana in South America. So successful was the result that the cultivation of coffee rapidly spread into other South American countries and the islands of the West Indies.

The climate of tropical South America and the West Indies is very similar to that of the lands bordering on the Indian Ocean. An equatorial current flows in the Atlantic Ocean from precisely

¹ The habit of coffee drinking may have received an important impetus by the use of the beverage among the worshippers of Islam for its stimulating and wakeful effects during their religious devotions.

the same causes as in the Pacific, and, setting westward, divides into two large streams off the eastern point of South America or Cape St. Roque. The northward flowing stream corresponds to the Japan current of the Pacific, and passing through the Caribbean Sea and Gulf of Mexico into the North Atlantic is known as the *Gulf Stream*. The one flowing south along the eastern coast of South America is called the *Brazil current*, corresponding in position and in its effects on the neighboring lands with the Mozambique current of the Indian Ocean.

Brazil has become the great coffee-producing country of the world, and all from the few seedlings of the plant sent to Holland from Java. Coffee is now grown wherever civilization has spread throughout the tropics. The principal coffee-growing countries to-day are Java, Ceylon, Sumatra, Mauritius, Southern Arabia, and the west coast of Africa in the eastern hemisphere; while Brazil, Bolivia, Peru, Guiana, Venezuela, Guatemala, Cuba, Jamaica, and the West Indies in general are the principal sources of supply in the western hemisphere.

LESSON II. — SUGAR AND SPICE.

The Sugar Cane. — The sugar cane is one of the grasses, and, like the other members of the order, consists of a stalk divided into joints, from each of which springs a long, sheathing leaf. The stalks are about twelve feet in height, and the mature plant flowers in a loose, feathery plume at the top. The outer surface of the joints, in the ripening cane, becomes smooth and hard from the silica or glassy deposit which they contain, while the interior is filled with a loose, spongy tissue, saturated with a watery juice that becomes thick and very sweet as the plant ripens.

The canes are cut near the ground and crushed in a mill of close-set iron rollers. The expressed juice is carried into a trough, then into vessels where it is purified by a filtering, heating, and chemical process. After this it is boiled down until it becomes thick, reaching the crystallizing point, and a few days later, in the 'curing

house,' the molasses is drained off from the raw crystallized sugar.

History, Range, and Commerce. — The origin of the sugar cane is not certainly known. The best authorities believe it to be a native of the low regions bordering on the Bay of Bengal and of Cochin China. The name 'sugar' comes from a root word common to the several languages of the Aryan peoples, and this fact points to a knowledge of its use at a very early period. The boiling of sugar was probably carried as a crude art from the Ganges region of India into China early in the seventh century, but it was not until the Arabs had invaded the far East that its refining became an art in the true sense of the word. The Arabs spread it westward, and the cane was cultivated from Persia to Morocco. Later, the Spaniards, in their era of discovery, spread the cultivation of the sugar cane into the islands of the Atlantic and the tropical regions of the New World.

The cane is essentially a tropical plant, and to-day is extensively cultivated in all hot countries near the sea level. About the middle of the eighteenth century the beet root was brought forward as a source of sugar, and its cultivation has since grown into a large and important industry.

The Spices. — The various spices have formed an important element of commerce from a very early date. The more important ones are natives of the forests of tropical Asia, especially along the coasts, and of the islands of the Indian Ocean. Very early in history the Molucca group became known as the 'Spice Islands,' and toward these the seafaring nations of Western Europe directed their voyages, which led, in part, to the remarkable 'era of discovery' in the fifteenth century.

Black Pepper is the dried fruit of a climbing shrub growing originally in the forests of the Malabar coast of India, but later introduced into the Malay Peninsula and Islands, Siam, the Philippines, and the West Indies. It has long formed an important article of commerce between India and Western Europe, and at one time was largely used as a tribute, the term 'pepper-corn

rents' lingering to the present day as a survival of the ancient practice. The high price of pepper during the Middle Ages led to the discovery of the Cape of Good Hope in the endeavor of the Portuguese to find a sea route to the East Indies, in order to obtain control of the spice trade.

Cinnamon is the bark of a small tree of the laurel tribe growing wild in the forests of Ceylon. It was not until the latter part of the eighteenth century that plantations of cinnamon were established in Ceylon with any success. Since then its cultivation has spread into the tropical countries of both hemispheres. It easily becomes wild again, as birds devour the fruit, and spread the seeds in the forests beyond the limits of cultivation.

The Nutmeg is the seed of a little tree growing wild in the Moluccas and Banda Islands, but also cultivated there, probably from a very early period. It reached Europe through the eastern trade, the Dutch at one time monopolizing its cultivation. It has since spread into the colonies of tropical America, Bencoolen, the Mauritius, and Madagascar. The nutmeg proper is the kernel of the seed, the thin husk-like covering surrounding it forming the 'mace' of commerce.

Cloves are the dried, aromatic flower-buds and their cups of a plant originally wild in the Moluccas, but now cultivated in other tropical countries. It formed one of the important spices sought by the early Portuguese voyagers who held control of the trade until superseded by the Dutch in their East Indian possessions. Cloves now come into the market from Zanzibar on the east coast of Africa, Amboyna, the Malay Islands, Guiana, and the West Indies.

LESSON III. — THE GRAINS, OR CEREALS.

Wheat. — The grains, or cereals, are all cultivated grasses that originally grew wild in various parts of the earth. Wheat has been under cultivation from the most remote historic time, so long, indeed, that there is no record of its ever having been found in

a wild state. This makes the fixing of its original home a matter of great difficulty, for, like many other anciently cultivated plants, its origin is involved in myth and fable. However, from its name in ancient languages, from ancient writings, and geographical observations, the best authorities now believe it to have been a native of the plains of Mesopotamia long before the dawn of history. From this region its cultivation spread east into China, and west as far as the Canary Islands, at a very early date. Evidence goes far to prove that wheat was cultivated by the Swiss Lake Dwellers during the prehistoric bronze period. It was grown in China 2700 years before the Christian Era, and looked upon as a gift from heaven. Ancient Egyptian monuments and the Scriptures allude to the cultivation of this important grain. The name 'cereal' comes from the Greek idea that Ceres, the goddess of harvests, bestowed wheat upon the earth.

Wheat reached the New World in the sixteenth century. Humboldt makes two very interesting statements in regard to the introduction of wheat into America: one to the effect that it came into Mexico with some rice brought from Spain by a negro slave of Cortez; and another, that while in Quito, he saw the earthen vase in which a monk had brought the first wheat grains sown in South America.

Range and Yield. — To-day wheat is grown throughout the world, except in equatorial regions, from Norway, Siberia, and British America to the Cape of Good Hope, Australia, and the Argentine Republic. Requiring an ordinarily fertile and fairly stiff soil with a goodly amount of moisture and sunlight, wheat readily adapts itself, over this wide geographical area, to various local conditions, and presents numerous varieties suitable for the time of year and place of growth. The yearly yield of wheat throughout the world has been estimated at not less than 2200 million bushels.

Thus wheat has come to be the staple food stuff of the civilized world. Only a very few countries have a sufficient surplus to export. In Europe, Russia and Roumania; in Asia, India; and

in America, the United States, the Argentine Republic, and Chile are the great exporting countries of the world.

Rice. — More than one-fourth of the human race depends almost entirely upon rice for its food. The grass from which the rice grains are gathered is a swamp lover, needing an abundance of moisture, and growing in the low, alluvial lands of the tropics, especially in districts liable to be flooded by great rivers. Its original home was probably in the river valleys of China and the low-lying lands about the Bay of Bengal.

It has probably been under cultivation for over 4000 years, as we read that in 2800 B.C. it played an important part in the ceremony instituted by the Chinese Emperor Chin-Nong.

It was probably first cultivated in China, spreading gradually to India and then slowly westward to the Euphrates. It did not reach Syria and Egypt for many centuries after its cultivation on the banks of the Euphrates, and no reference is made to it on old Egyptian monuments. The Arabs carried it still farther westward, into Spain and Italy, but it did not reach the New World until a comparatively late date. Rice is chiefly consumed in the countries where it grows, and its commercial value is unimportant compared with that of other cereals.

Other Grains. — *Rye*, *oats*, and *barley* are largely grown throughout the temperate regions, especially to the north, where the climate is better suited to them than to wheat. In some parts of Europe, one or the other of them forms the staple food supply.

Maize or *Indian corn* is a native of the warm parts of America, but it has spread since the discovery of the country into other lands. Its cultivation along with that of tobacco, another New-World plant, has penetrated into the heart of the African continent, where it forms an important food of many tribes. To-day not less than 120,000 square miles in the United States are under corn cultivation. The 'corn belt' of the States does not extend much beyond the 42d parallel of north latitude.

LESSON IV.—SOME VEGETABLES AND FRUITS.

The Potato. — The potato is a tuber or enlarged underground portion of the stem of a perennial plant, serving as a storehouse of starch. The plant was originally a native of temperate South America, probably Chile, though cultivated northward along the high ranges of the Peruvian Andes, where the climate of the altitude corresponds to the cooler southern latitude. It was undoubtedly cultivated long before the discovery of the country by Europeans, and it came into the Old World first through the Spaniards, and later through the English in the time of Sir Walter Raleigh.

The potato is especially useful as a food stuff in cool climates, like the British Isles, where the summer is too short to reap a large harvest of grain. It forms the staple article of diet for the poorer classes of Ireland, and the failure of the Irish potato crop, from a peculiar disease caused by a fungus, has several times produced a disastrous famine in that country.

Sweet Potato. — This plant is in no way related to the common or white potato, but belongs to an entirely different family, that of the morning glories. It is a climbing vine, and the edible part is not a tuber or underground stem, but a true root enlarged as a storehouse of starch and sugar. It is a native of the warmer regions of both hemispheres, but it has never been found wild. Its original home is a matter of uncertainty, as the plant appears to have been cultivated in both hemispheres from a very early period.

Yams. — Yams are the tuberous rootstocks or underground stems of several species of plants cultivated in tropical countries, and form a staple food supply of many native tribes. The original home is uncertain, the plant to-day being found wild in Asia and the adjacent islands, and a few species in Africa and America. It is cultivated throughout these regions and also in the Pacific Islands.

Manioc. — The swollen, starch-filled roots of several species

of spurgewort or euphorbia are used by the natives as food in tropical America and Africa. Besides the starch, the root contains a poisonous principle which is separated from the nutritious part by pounding and heating. In this way the *cassava meal* or *bread* of the native tribes is produced. The starch, carefully separated from the other matters of the root and heated until its grains swell up, forms the *tapioca* of commerce which is shipped in large quantities from South American and West Indian ports. The careless preparation of the manioc by the followers of Stanley, in his journey up the Congo in Central Africa on the Emin Pasha Relief Expedition, was the cause of great loss of life and disaster to the Rear Column. The manioc is found wild in Brazil, and is undoubtedly a native of tropical America, having reached Africa as a cultivated plant since the discovery of the New World.

The Tomato. — The tomato is the fruit of a plant belonging to the same natural order as the potato. It is a native of tropical America, probably Peru, as a wild form is found growing on the seashore of that country. It was not known in the Old World until after the discovery of America. The name 'tomato' is of American origin, and its cultivation, at least in Peru, appears to be quite ancient.

The Banana and Plantain. — Bananas and plantains are the fruits of several closely related plants cultivated throughout the tropical regions of both hemispheres. They form the principal food stuff of an immense number of savage peoples. The number of varieties, both cultivated and wild, found in Asia, points to its original cultivation in that continent, probably in the Malay Archipelago. From the fact that the names of the plant are entirely different in the oldest languages, we are led to believe that the culture of the banana reaches back to a remote antiquity in these islands and also in India and China. It spread at a very early date into Africa and the Pacific Islands. It was probably introduced into tropical America by the Spaniards and Portuguese very soon after the discovery of the country.

As a food the banana is second to no other plant in the world,

as it requires little, if any, cultivation. Humboldt estimates that the yield in nutritive material of a given area planted in bananas is 133 times that of wheat, and 44 times that of the potato.

The Date. — The fruit of the date palm has been used as a food from time immemorial by the peoples dwelling along the borders of the deserts and in the oases of North Africa and Arabia. The date palm is indigenous to the desert regions stretching from the Atlantic Ocean to the Valley of the Indus in India. It also occurs in the Canary Islands, and wherever found appears to be of very ancient cultivation. The tree is found to-day in much the same area of country as it was five thousand years ago as indicated by ancient writings. It is essentially a plant of the warm, dry zone, and has not been successfully cultivated beyond this region.

The Vine. — The grapevine is of very ancient cultivation in Eastern countries. It is spoken of in the oldest writings, and in Egypt its culture and the making of wine date back five or six thousand years. It grows wild in Western Asia and the Mediterranean region—Southern Europe and Northwestern Africa. From all that has been gathered on the subject it seems that the vine grew wild somewhere south of the Caspian Sea and that it was dispersed, probably before the appearance of man, over a considerable area largely through the agency of birds carrying the seeds. Its cultivation reached China a little more than one hundred years before the Christian Era. It is cultivated to-day around the world in the temperate zones, between about 50° north and 40° south latitude.

LESSON V.—COTTON AND FLAX.

Clothing. — Next to food, clothing is perhaps the most important element in human affairs. From time immemorial the fibers of plants, and the skins and wool of animals have been woven by most of the peoples of the earth into garments for covering the body. Even in the tropics the instinct to cover and decorate some portion of the body seems to be universal, extending through

all savage tribes. Of the plants used for this purpose, cotton and flax are by far the most important and widespread.

Cotton. — The fine fibrous down of the seeds of plants belonging to the mallow family forms the cotton of commerce. The plant appears to have originated somewhere in tropical Asia, probably in India, as its cultivation and use as a clothing material have existed there for more than 2000 years. It became known to the Greek and Roman world after the conquests of Alexander in the East. It reached China only in the ninth or tenth century of the Christian Era.

Cotton was found in a state of cultivation by the Spanish discoverers of America, but the plant cultivated in America to-day is the Old-World species, introduced at a comparatively late date. The principal sources of supply to the world to-day are the Southern United States and India, though China, Egypt, Africa, Australia, Italy, Greece and Turkey, Brazil, Peru, and the West Indies are all cotton-growing countries. The influence of the Civil War in the United States developed the raising of cotton in other countries for a time, in order to supply the demands of trade, crippled by the stopping of the United States export. —

The part that cotton has played in the history and development of mankind is remarkable. An advance has been made from the rudest methods of manufacture, over a limited portion of the earth, to the invention of the most complex machinery and the employment of many thousands of persons in various parts of the world. The institution of slavery in the United States, with its stupendous results, was due to a demand for cheap labor in the cotton fields. Among the principal materials manufactured from cotton are thread, muslin, and calico. The term 'muslin' comes from the city of Mosul on the Tigris in Mesopotamia, where the stuff was first woven. 'Calico' is from Calicut, a seaport on the west coast of India.

Flax. — The fibers of the flax plant have been used in the manufacture of clothing and for various purposes of utility from the remotest historic times, and even by prehistoric peoples.

Bundles of flax have been found among the remains of the Lake Dwellers of Switzerland and of a prehistoric people inhabiting the country now known as Lombardy in France. The material called *linen*, which is made from flax, is referred to in ancient Scripture. In Egypt and Chaldea the plant was in use apparently at the beginning of history, the mummy cloth of the catacombs being of this material.

The annual flax is still found wild in the region of the Persian Gulf and the Black and Caspian seas. This probably represents its original home, from which it spread, very early, as a cultivated plant into Egypt, and later into Europe by the western branch of the Aryan peoples. The Finns appear to have carried it to the north of Europe at a very early date, and last of all it reached India through the eastern branch of the Aryans. —

The flax used by the prehistoric peoples of Europe belonged to a perennial species which has been replaced by the annual. To-day flax is grown in all temperate regions. The word *lin* exists as a root in the Aryan languages of Southern Europe — the Greek, Latin, Slav, and Keltic. It is from this that we get our word 'linen,' the material which is made from flax. The word 'flax' is of German or Teutonic origin, and other names for it are used in the North of Europe.

This diversity of names indicates a remote antiquity of cultivation, for where one people have borrowed the culture of a plant from another, they have usually borrowed the name also. Evidence of a varied nature thus goes far to prove that flax has been known to man for a period of time reaching back beyond the dawn of history, considerably more than 5000 years.

In this short survey of a few of the plants useful to mankind, we have covered a wide extent of the earth's surface, and gone over many centuries of history. The common things of daily life are seen in a new light. Geography appeals to us with a new interest, — that of the earth as the home of man; how that home has influenced him, and what he has done toward making the home what we see it to-day.

From every quarter of the globe he has gathered plants for food and clothing, in many cases entirely changing the face of a country. A prairie landscape becomes acres of waving wheat ; the once thickly wooded mountain slope is now a field of tasseled corn. Back of all this, however, we have caught a glimpse of the limitations which the earth has set upon man. Climate is the master hand under which he still works. Strive as he may, climate still directs his doings, and maps out just how far he can scatter the seeds of strange plants, or introduce new animals.

To meet the requirements of climate man has brought commerce to his aid ; built seaport cities on every shore throughout the world ; sent his ships to the ends of the earth ; belted the globe with cables, and spanned the continents with railways. To-day we sit at our breakfast tables sipping tea from China sweetened with sugar from the canebrakes of the West Indies. Our rolls are made from wheat grown on the prairies of Dakota. Spices are brought to our table from the Molucca Islands, Ceylon, or tropical America. Flax fibers, maybe from a crop sown in far-away New Zealand, or on the plains of Europe, are spun into white linen for our tablecloths. The things of to-day are our inheritance from the very beginning, because Geography has so directed the course of human events.

CHAPTER IV.

ANIMALS WHICH HAVE AFFECTED MAN.

READING IN CONNECTION WITH THE LESSONS OF THIS CHAPTER.

Primitive Man. — Figuiet.

Articles on the Various Animals and Animal Products. — Encyclopædia Britannica.

LESSON I.—ANIMALS OF THE CHASE.

Primitive Conditions ; Food, Raiment, and Defense. — The various animals with which man has been associated in different parts of the earth have, from the remotest time, played an important part in his history and development. The animal as well as the plant has always been a source of food and clothing, supplying these primary needs of man in a variety of ways. According to the distribution of life under the various conditions of climate, different phases of this question of food and raiment present themselves. Thus in the far North, among the Eskimos and the tribes of Northern Asia, the food and clothing are almost entirely of an animal nature, while in the tropics plant life furnishes the main source of these supplies. In the temperate regions a mingling of the animal and plant products is a striking feature of the food and covering of man. The mingling of these two elements has been of undoubted advantage to the nations of the temperate realm. The physiological characteristics of man in the different regions of the earth are largely the result of the difference in kind and use of these two great factors — food and clothing.

The animal came into relation with primitive man other than as a source of food and clothing. The giant mammalia of the Quaternary period¹ were formidable adversaries in man's struggle for existence, and abundant proof of this long and desperate encounter is seen in the rude weapons of the Stone Age. We may even regard the great carnivora² of the Quaternary as a means in man's development, bending his intelligence toward the fashioning of weapons of defense.

Geography of the Chase. — From defending himself against his brute foes, man gradually became a hunter. The rude palæoliths³ gave place to the more perfectly fashioned spear and axe heads of the Polished Stone Age, and later, to the various weapons of bronze and iron. The chase took on different features in different parts of the earth. Among the earliest animals of the chase, sought alike for the purpose of food and clothing, was the reindeer, vast herds of which wandered over Central Europe and Asia toward the close of the Glacial Period. So important was this animal to primitive man, as attested by its abundant remains in the cave shelters of various localities, that a distinct "Reindeer Epoch" marks the later Palæolithic Age. In the temperate and northern lands, various species of deer have always been objects of the chase. Passing from a necessity to a pastime, stag hunting became royal sport in the barbaric civilization of early Europe. "To drive the deer with hound and horn" was a theme of the early bards, and the royal buckhounds are, to-day, a survival of this time-honored sport.

The North American bison and the auroch of Europe, two closely related species belonging to the ox tribe, have been hunted

¹ *Quaternary*: the period of time immediately preceding the Present Era characterized by the abundance of large mammalia, and the earliest appearance of man upon the earth.

² *Carnivora*: Flesh-eating mammals — as the dog, cat, bear, lion, etc.

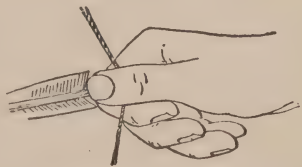
³ *Palæolith* is an unpolished stone implement, and comes from two Greek words meaning *ancient* and *stone*. Hence we speak of the Palæolithic or Old Stone Age.

Neolithic: the age of polished stone implements, from two Greek words meaning *new* and *stone*.

to the verge of extinction. The bear and the wolf have been hunted in northern lands for the sake of their warm fur, and as foes of man. The flesh of the bear is used as an article of food among various savage peoples. Over many parts of Europe the wild boar has long been an object of the chase, its pursuit, like that of the deer, being first a necessity for increasing the food supply, and degenerating in later times to a mere sport. So with fowling and fishing — the need of food was the first requisite, and what is now a sport with civilized peoples is a downright question of existence with the savage of Northern countries and the settler in new lands.

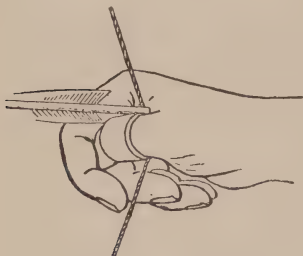
The trapping of animals is only another form of the chase, and it is largely practiced by the tribes of Arctic America and Northern Eurasia. It was most likely developed as a necessity, the habits of many of the smaller fur-bearing animals like the beaver, marten, ermine, sable, otter, and others rendering open pursuit impossible.

The Eskimo, and the Siberian hunters, still pursue the reindeer over the frozen plains of the North; spear the walrus, seal, and narwhal amid the ice floes of the Arctic Ocean, and defend themselves with rude but effective weapons from the attacks of the polar bear. In the tropics food and defence, more than clothing, are the principal incentives to hunting. Peculiar methods and weapons have been developed like the deadly blow tube of the South American natives, the pitfall and heavy drop-spear of Africa for killing large animals, such as the elephant and the hippopotamus. Open pursuit is an exception in the tropics, the dense cover of vegetation giving rise to ambuscading and stalking methods. The bow and arrow appears to have been largely used among the peoples of the North Temperate regions, and by others widely distributed over the earth. Several forms of "arrow-release" are characteristic of different regions.



Primary Arrow-Release.

The most important of these are the primary, — the primitive method of holding the arrow to the bow string practiced by the majority of savages, — the Mongolian arrow-release of Asian peoples, and the Mediterranean arrow-release of the white race. The efficiency of the last two methods gave to these races superiority in early warfare.¹



Mongolian Arrow-Release.



Mediterranean Arrow-Release.

LESSON II. — THE DOMESTICATION OF ANIMALS.

Primitive Conditions. — The taming of wild animals probably arose at a very remote period as a natural result of the observations of primitive men. In the chase slightly wounded animals must have frequently been taken alive and, more often, the young captured after killing the parents. This led to a partial domestication and gradually, through observation, to different uses of various animals. Man's inventive faculties and his powers of observation led him, under stress of surrounding conditions, to the cultivation of wild plants in many parts of the earth. Coupled with these beginnings of agriculture was the domestication of animals. It is a striking fact, however, that the majority of domestic animals are natives of the Temperate regions of Eurasia, where the stress of climate and other geographical conditions have been most potent as formative influences in the destiny of races. In this respect the black race is in striking contrast with the white. Surrounded by large animals of many kinds, such as the

¹ Professor E. S. Morse — quoted by Brinton.

zebra, various antelopes, and the elephant, the black man never reached a culture sufficiently high to bring into his service animals equally as serviceable as those that the white man ages ago domesticated. The Negroids of the East and South African grasslands have herds of cattle, sheep, and goats, but they are the descendants of the animals domesticated centuries ago by the white race in Egypt. Pastoral life, though often rude and barbarous, is a step toward a higher culture. The uncertainty of securing game and the frequent failure of the food supply in the Temperate regions must very early have led man to the cultivation and domestication of those wild stocks of plants and animals, the descendants of which, to-day, form the basis of his wealth and well-being.

The Dog. — From what the remains of primitive man tell in the Neolithic shell heaps and kitchen-middens of various countries, we are led to believe that the dog was the most anciently domesticated animal. Man being first a hunter must have frequently seen wolves running down their prey, and nothing could have been more natural than to train the young of these animals to pursue and capture game. The wolf is an inhabitant of the cold and temperate lands, and the dog appears to have arisen in the same regions. Whether the wolf is the original wild stock from which the dog sprang, or whether it was a distinct and primitive species which has been lost by crossing and breeding in the long ages of domestication, is a matter of uncertainty. Whatever the case may be, the dog first became the companion of man under the conditions of the chase. With the domestication of other animals, and the abandoning of the hunting for the pastoral life, the dog became the protector of the flocks and the watcher of the household.

The natives of the tropics did not originally possess the dog, and it is only sparingly found among them to-day. Throughout the vast stretches of Eurasia and North America the various tribes have possessed the dog from a remote antiquity. In the far North the Greenland hunter has his pack of half-savage, wolf-like dogs that drag him in rude sledges over the ice fields, or

vigorously defend him from the bear. Every Indian village has its troop of dogs. Among the inhabitants of Siberia the dog shares alike in the excitement of the chase and the drudgery of the march.

The different breeds of dogs first arose from natural causes. The wolf-dog guarding the flocks was the companion of the lonely shepherd, and we may look upon our collie of to-day as a survival of this breed. The various hounds and the hunting breeds have come from the earliest dogs of the chase. The mastiff and his kind were watch dogs of the home in half-civilized Europe of early days.

The Ox, Sheep, and Goat. — The domestication of cattle extends back to a remote period, the remains of the ox having been found in connection with Swiss Lake dwellings of the Neolithic Age. Several wild stocks inhabited Western Europe at the time of man's appearance, and are undoubtedly the ancestors of several existing breeds, as the Scotch and Welsh breeds, the Chillingham cattle and others. In the East the ox appears as a domestic animal with the dawn of history. It was figured on Egyptian monuments two thousand years before the Christian Era. The wealth of the earliest peoples was in their flocks and herds. Pastoral life was undoubtedly the first step in agriculture, man passing from the wandering life of the herdsman to settled village communities. In Japan, India, and Western Africa several breeds of humped cattle have been under domestication from the remotest antiquity. In India the white breed of the humped bull or zebu is held sacred by the Hindus in their worship of Siva. Among the tribes of South Africa several peculiar breeds occur, notably the *backleys* of the Kaffirs, which are trained to guard flocks like dogs. After the Spanish conquest of America, a number of cattle escaped from the armies, and now countless thousands roam over the pampas of the Argentine Republic.

The present breeds of domestic sheep appear to have sprung, at a very remote period, from several races inhabiting the highlands of Central Eurasia. Like the ox, the sheep was a domestic

animal in Central Europe and Asia before the opening of history. Whether any of the existing wild stocks now living in the mountainous regions of that continent are the parents of the domestic sheep is a matter of conjecture. The sheep is naturally a mountain lover, and several wild species are to be met with on the lofty ranges of the world. Some magnificent species occur on the Pamir, Thian Shan, and Stanovi ranges, while the "big horn" of the Rocky Mountains in North America, the aoudad of the Atlas range in North Africa; the moufflon of Corsica and Sardinia, and several other forms are conspicuous animals of their respective regions.

Like the sheep, the common domestic goat appears to have sprung from some wild ancestor, now lost, which undoubtedly inhabited the lofty mountains of Central Asia. To-day several wild breeds are known, as the Persian wild-goat or Paseng, and the goat-like ibex of the Alps. A number of other domestic breeds are known besides the common form, as the Syrian, Angora, Kashmir, Maltese, the Egyptian or Nubian goat, and the curious Guinea or dwarf goat of Western Africa. Some of these breeds, as the Angora and Kashmir goats, are valuable on account of the abundance and fineness of their wool.

The milking of such animals as the cow, sheep, and goat must have begun at a very remote period in the history of mankind. Our English word "daughter" comes from an ancient Aryan root meaning "a milker," probably in allusion to her office in the household. Throughout history the various uses of these wonderfully helpful animals have been one of the mainsprings of advancing civilization, and to-day they have spread with man into all lands.

The Horse, Ass, and Mule. — Though the ox was in use as a draught animal in many countries in the early ages of history, the horse and the ass gradually took its place in this respect. In the earliest times of their domestication, while the ass bore with the ox the burden of work, the horse appeared in battle and in the chase. In Western Europe there is abundant proof of the

domestication of the horse during the Polished Stone epoch from the rude drawings which have been found of the animal and the relations of its remains to those of man. The horse of to-day is in all likelihood the descendant of a wild stock domesticated ages ago in Western Asia. On the steppes and among the mountains of that country a horse has recently been found running wild in small herds, which may represent the original stock from which all the domestic breeds of horses have descended. Among the roving tribes of the Kirghiz steppes horses not only perform their ordinary service to man but stand in place of the flock as milch animals. The milk of the mares yields, under fermentation, an intoxicating drink called "koumys."

The ass appears to have come into use as a domestic animal in the East, probably in Syria or Egypt. Its close resemblance to the wild ass of the mountains of Abyssinia makes it appear probable that this was the original source of the domestic breed. Wild asses abound in the mountainous parts of Asia Minor, but they do not bear so close a resemblance to the common form as does the Abyssinian species. In South Africa the peculiar striped group of horses occur—the zebra, the dauw, and the quagga, which have never been domesticated. After the Spanish invasion of America horses ran wild from the armies of Cortez and Pizarro and soon multiplied into herds of many thousands in both continents. Though the horse is not indigenous to America, it is curious to note that the fossil remains of a horse have been found in some parts of this country. The animal appears to have become extinct just before the beginning of the present era.

The mule, a hybrid between the mare and the male ass, has been known from very early times. It was in use in ancient Greece and is supposed to have been originally bred by the inhabitants of Mysia and Paphlagonia. The mule combines the good qualities of both parents. It is a hardy, sure-footed animal, well adapted for pack and draught purposes in mountainous countries and in hot, dry climates. It enjoys a remarkable freedom from diseases which are often fatal to horses. With these qualities it

has largely superseded the horse as a beast of burden in many countries, especially the mountainous parts of Southern Europe, France, Spain, and Italy, and in North and South America. The mule has become an important transport animal in military operations, and the "mule battery," the animal bearing the screw-gun pieces, is resorted to in countries where the use of the gun carriage is impossible, as in the Punjab district in India.

The Pig. — The domestication of the pig is probably of a very early date. Frequent reference is made to the animal in ancient literature, as in the *Odyssey*, where Circe transforms the companions of Ulysses into swine.

"Forthwith she smote them with her wand divine,
And drave them out, and shut them close in styes,
Where they the head, voice, form, and hair of swine
Took, but the heart stayed sane, as ere the wine
Confused them; they thus to their lairs retreat;
She food, whereon the brutish herd might dine,
Furnished, mast, acorns their familiar meat,
Such as earth-groveling swine are ever wont to eat."

(*Worsley*), *Odyssey* x., 203, 243.

The original wild stock of the various domestic breeds is not known, but it was undoubtedly an inhabitant of some portion of Central Eurasia. The hog has spread with man to all parts of the earth, and the preparation of its various products — bristles, flesh, lard, etc., forms a vast industry in several countries, notably in the United States, where their export ranks with that of wheat and cotton, and in Servia.

Fowls. — The various breeds of chickens or barn-door fowls have all undoubtedly descended from a common wild stock — the red jungle-fowl of India. Its domestication was probably begun in Burmah and neighboring countries at a very remote period of antiquity, as Chinese tradition says that poultry came from the West about 1400 B.C. Fowls are not referred to in ancient Greek or Hebrew literature, but figure on Babylonian cylinders six or seven centuries before the birth of Christ. Aristophanes refers

to the fowl as coming from Persia, which helps to confirm the fact of its earliest domestication in the East. The domestication of ducks and geese likewise goes back to very remote times. The wild mallard is probably the original stock of the common duck, while the goose appears to have sprung from several distinct species in different parts of the world, one form in China, and the common form from the wild gray-lag goose of Eurasia.

The farm of to-day thus affords a study in the history of mankind, for here are gathered almost all of the animals that he originally domesticated ages before the dawn of history. This very ancient action of man's intelligence has not extended to other animals within the historic period, but has steadily bent its energy toward the perfection of the original stocks through long centuries of careful breeding.

Other Domesticated Animals.—In certain regions several animals have been domesticated from the earliest times, but have not spread to any extent from their original centers owing to climate and other surrounding conditions. The domestication of the two species of camel in Central and Southern Asia and North Africa is of extremely ancient origin, so ancient that no wild stock has ever been known. Its wonderful adaptation to the deserts and mountainous table-lands rendered it almost indispensable as a beast of burden in those countries. The two-humped or Bactrian camel inhabits Central Asia from Lake Baikal to China, where it endures a rigorous winter cold. The one-humped Arabian species or dromedary, in use from the Sahara to India, is the 'ship of the desert,' the only means throughout history by which those savage wastes have been penetrated.

Several species of llama, a form closely allied to the camel, are natives of the lofty Andes ranges from Peru to Patagonia, where one of the species was in use as a beast of burden at the time of the discovery of the continent.

The use of the elephant in India as a beast of burden and in warfare extends back into the remote ages before history, and it figures conspicuously in the battles of the ancient kings of the

Indies against invaders. Its unwieldy size and difficult management rendered it useless against the charge of a well-disciplined body of horse, and it gradually passed out of active warfare. The African elephant has been domesticated but once in the history of mankind, and that by the ancient Carthaginians. It was undoubtedly this species that Hannibal used in carrying the paraphernalia of war across the Alps against Rome, and which the Romans captured and used in their royal sports and military pageants.

The curious yak, an ox-like animal, has long been in use by the inhabitants of the lofty table-land of Tibet, for the sake of its milk, and long, thick hair, as well as for a beast of burden. In the far north of Eurasia many tribes have had the reindeer under domestication from time immemorial. It stands in the place of a draught animal and beast of burden to these people; supplies them with milk and flesh, and its skin forms their raiment and the covering of their tents.

LESSON III.—SOME SPECIAL ANIMAL PRODUCTS.

Leather. — The climatic extremes of the Temperate and Northern realms very early forced man to protect himself with some sort of covering. The fresh skins stripped from wild animals were undoubtedly the first covering of the human species. The more or less rapid decomposition of these skins gradually developed an art directed toward their preservation, and we find the *tanning* of hides and their conversion into leather among the oldest of human arts. When and how man became acquainted with the remarkable property of certain plants for this purpose, can only be conjectured. That it arose in the Temperate regions is beyond doubt, for there the oak and other tannin-producing plants flourished, and oak bark appears to have been the earliest human agent in tanning.

The production of leather is a vast industry in many countries to-day, the hides of a great number of animals are used, and there are various curing processes other than tanning, such as *tawing* with mineral salts, and dressing with oil or *shamoying*. The skins of nearly all domestic animals are now employed in the manufact-

ure of leather, besides those of many wild animals, as the walrus, hippopotamus, kangaroo, zebra, seal, porpoise, deer, buffalo, antelope, etc.

Wool. — The wearing of the hairy side of an animal's skin next the body to secure greater warmth must have been the first step in man's intelligence that led to the use of wool as a covering material. The shearing of sheep and the spinning of wool are as old as the oldest history, and stand out as vivid pictures of the early pastoral and home life of the peoples of Western Asia, Egypt, and Europe. Wool ranks next to cotton as the most important textile fabric, and the history of woolen manufactures in later times abounds with inventions of complicated machines. This, with the perfection of the material through the various processes of cleaning and handling raw wool, and the intelligent breeding of sheep, has been one of the important factors in the advance of civilization. Into whatever region the white man has spread, except the low tropical countries and arid deserts, the sheep, the spinning wheel, and later the woolen mill have followed. Where once the housewife spun the wool of her goodman's flocks into clothing, as may still be seen in some out-of-the-way mountain homesteads in Scotland and the North, hundreds of thousands of people now find employment in the woolen mills of the world, and Australia, New Zealand, and the Cape of Good Hope annually export their millions of pounds.

It is curious to note how man's mind has worked toward the same ends in widely different parts of the world. While the rude inhabitants of Europe and Western Asia were spinning the wool of their sheep, the Peruvian on the high Andes was making his llama and alpaca wool into wonderful vestments; the Oriental was using his camel's hair, and the mohair and fleece of two species of goats were being wrought into fabrics in Angora of Asia Minor, and among the mountain vales of Kashmir.

Silk. — The cocoons and webs of many insects are composed of a fibrous substance which yields a thread in spinning, but the art of using this material was known to only one people for long

ages of history. The cocoon of the silk moth, whose worm or larva feeds on the leaves of the mulberry tree of China, was used by the Chinese at a period so remote that, like tea-culture, it is lost in the mists of tradition. The cultivation of the mulberry, the rearing of worms, and the reeling of silk was an industry in China more than two thousand years before Christ. A knowledge of this material spread into Japan through Korea some three hundred years before the Christian Era. Somewhat later it reached India, a tradition being that the eggs of the insect and the seeds of the mulberry were brought concealed in the head-dress of a Chinese princess.

From the valley of the Ganges sericulture slowly spread westward into Persia and Asia Minor. Aristotle first makes mention of the silk-worm in Grecian literature, and refers to the spinning of silk in the island of Cos by Pamphile, daughter of Plates. The word "silk"* is of Grecian origin and refers to China, the land of its first culture.

Raw silk became an important item of trade at the beginning of the Christian Era, increasing in costliness until it was said to be worth its weight in gold. The Emperor Justinian held a monopoly of the silk trade in Constantinople and endeavored to direct it from the road through Persia, whence it reached the West. This was not accomplished, but two Persian monks, who had learned the art of silk culture after a long residence in China, imparted the mystery to Justinian. Returning to China they brought back a number of silk-worm eggs concealed in a hollow cane. This was about 550 A.D., and marked the beginning of sericulture in the Western world, for literally out of this hollow cane came the silk trade that enriched the civilized world for twelve hundred years.

Under the Saracen conquest the silk trade and culture spread westward through Europe, ultimately reaching Italy and France. Silk manufacture came into England under the reign of Henry VI., receiving an important impetus in 1585, when the skillful Flemish weavers came over, having fled from the religious troubles with

* From the Greek *Seres*, a people of Eastern Asia celebrated for their silks.

Spain. One hundred years later the edict of Nantes drove the weavers of France into England, Germany, and Switzerland.

Efforts were made at an early date to introduce silk culture into the New World, notably by Cortez in Mexico, all traces of which have been lost, and in the settlements of Virginia. This last spread through the Colonies, but was checked by the War of Independence. In 1838 the culture of the silk-worm reached a mania in the United States through the supposed capabilities of the South Sea Islands mulberry, or *multicaulis*, as a silk-worm food. Thousands of acres were given over to the growth of this plant, but it soon proved to be a hollow speculation. To-day efforts are made in various places to establish silk culture with little apparent success. It is not a question of climate but of cheap labor, and China, Japan, Bengal, and the Eastern Mediterranean are the silk-producing countries of the world.

CHAPTER V.

MAN.

READING IN CONNECTION WITH THIS CHAPTER.

* Races and Peoples. — Brinton.

* Anthropology. — Tylor.

Earth and Man. — Guyot.

Herodotus.

LESSON I. — TYPES OR RACES OF MAN.

Main Types or Races. — The three original types of mankind are to be met with to-day in our own country, — the *White Man*, the *Black Man*, and the *Yellow Man*. The white race is the one to which we ourselves belong, and no matter how varied the different peoples of this race may appear, they all present the broad and striking features of the white type.

The pure-blood black man or negro is known at once by his characteristic features, hair, and coloring. So with the yellow man, as seen in the Chinaman, his peculiar traits are distinctive and unmistakable.

Every child in his daily walks meets with these three ancient types of man. He knows them all to be men, but very different in appearance. This difference is the result of their long residence and geographical separation in widely different parts of the earth. They are brothers that long ages ago wandered away from their first home and came to dwell in lands so different in character and climate that each, throughout the long years that followed,

changed under the action of these all-powerful geographical conditions. Their peculiar characteristics became fixed by long residence in their different countries, so that to-day we behold the *white*, the *black*, and the *yellow* types of man.

We can recognize the distinctive traits of these three great types in three well-marked features of each.

Physical Traits of the Races. — The white man, wherever found, is at once recognized by the following well-marked traits: 1. by his *white color*, varying between darker and lighter shades, or *brunette* and *blonde* types, but always unmistakably white; 2. by his *wavy hair*; and 3. by his *narrow nose*.

The black man is at once the opposite of the white man in the color of his skin and the character of his hair and nose: 1. his color is *black* or *dark*; 2. his hair *frizzly* or *crinkled*; and 3. his nose is *broad*.

The yellow man is equally distinct from the other two: 1. his color is *yellow* or *olive*; 2. his hair *straight*; and 3. his nose *medium*, neither very broad nor very narrow.

Culture and Civilization. — Man, no matter what his circumstances in life, always presents a certain amount of *culture*. The term 'culture' is used to indicate the possession, by man, of any art no matter how primitive or crude it may be. Weapons or tools, whether they be a bow and arrow or a repeating rifle; two flat stones for grinding corn or a steam mill with its complicated machinery; the crudest ideas about God and Nature, or the highest ideals of divinity, literature, and science — all these are forms or expressions of culture. These differences in culture among the various peoples imply more or less different states of society, though a people may be highly advanced in one art or conception and have comparative crude ideas of others. *Savage* and *barbarian* are terms indicating comparatively low and primitive states of culture and society, while *civilization* includes culture in its highest and widest sense and is, therefore, an advanced state of society.

Social Status of the Races. — The black man stands lowest in

the social scale and in point of culture. The vast majority of his people are savage, cultivating the arts of life in their lowest and simplest forms. War and the chase form the principal occupations of these savage tribes, and, though some possess the art of smelting ores and fashioning weapons, often of wonderful design, their condition is relatively low. The religion of the negro is largely material in its nature, being the worship of some animal as a tribe *totem*, and a belief in the power of departed spirits. The only ideal element, if it can be so called, in this material religion is one of witchcraft and sorcery.

In the yellow man we see a decided advance in culture over the negro. In a few instances, as in the Chinese and Japanese, he has reached a comparatively high degree of civilization. Still his arts are, with some striking exceptions, crude, his ideals far from high, and his religious conceptions of a decidedly material nature. A large portion of his race are barbarians — wandering tribes following their herds and flocks over vast stretches of pasture land without any definite occupation.

The white man, on the other hand, possesses a culture so far advanced in its development that the term civilization is used to embrace his entire social state. His arts of life are not only far above those of other races, but in thought and imagination he reaches heights unknown to any other race of men, and his religion is of a purely spiritual and ideal character.

Cause of the Different Social States. — The cause of the difference in culture among the races of mankind is to be found in inherent traits fixed at a very early period by various causes. Among these, conditions of a geographical nature undoubtedly play, and always have played, a very important part. Just how these causes have operated in producing the different physical traits is a very difficult question to determine, but their effect on the social life is much more apparent. This we can see when viewing the distribution of the different races on the earth's surface.

LESSON II. — GEOGRAPHICAL DISTRIBUTION OF THE WHITE RACE.

READING IN CONNECTION WITH THIS LESSON.

A Short History of the English People. — Green.

*Outlines of Universal History. — Fisher.

*The Aryan Race. — Morris.

Land of the Midnight Sun. — Du Chaillu.

Hours of Exercise in the Alps. — Tyndall.

Views Afoot. — Bayard Taylor.

*Germanic Origins. — Gummere.

Original Home. — The name Caucasian has been applied to the white race from the supposition that the purest type of the white man now inhabits the region of the Caucasus Mountains, and that, therefore, this was the original home of the race. Recent studies, however, have thrown more light on the subject, and all the evidence brought forward goes far to prove that the purest type is not the man of the Caucasus, nor does that region offer, in any way, the slightest proof that it was the cradle of the white race. There is evidence, moreover, that the original home of the white man was somewhere in the Western Mediterranean region — South-western Europe and Northern Africa. To-day the purest type of the white race is supposed to survive in the Berber peoples, living in the valleys of the Atlas Mountains in Northwestern Africa. The Egyptian peoples belong to the white race, and their civilization, the oldest in the world, is nearest to this region.

The South Mediterranean Branch of the White Race. — In ancient times the Libyan group of Hamitic peoples, to which the Berbers and other tribes belonged, occupied the entire extent of the northern portion of the Sahara Desert and the present Barbary States, from the Atlantic Ocean to the Nile Valley.¹ East of this, various Semitic peoples, as the Israelites, ancient Chaldeans, Abyssinians, Arabs, Bedouins, etc., occupied the country known as Syria

¹ The ancient Egyptians and their existing representatives, the Copts and Fellahs peoples, also the Somalis, Gallas, Khamirs, and other tribes living in the vicinity of the Red Sea, belong to the Hamitic stock of the white race.

and Palestine, Abyssinia, the peninsula of Arabia, and the valley of the Euphrates. In the fertile plains between the Tigris and Euphrates, the land of Mesopotamia, were developed those famous civilizations of history — the Babylonian and Assyrian.

The South Mediterranean peoples of the white race have always lived surrounded by the savage landscape of the desert. They have been largely roving and warlike tribes, traders threading with their caravans the wastes of the Sahara and Arabian deserts. Their few fertile oases, river valleys, and strips of coast line have offered the barest inducements to the development of civilization, and yet from among these peoples has arisen not only the culture of the civilized world to-day, but also the most sublime religious ideals — Christianity and Mohammedanism.



Abd-El-Kader; Semitic stock of white race. (After Quatrefages.)

The North Mediterranean Branch of the White Race. — The Mediterranean Sea long separated the white race into its two primary branches, the peoples of Northern Africa and those inhabiting Southern Europe. At the dawn of history the North Mediterranean branch was far behind the African section in culture and civilization. They were mere wandering hordes, beginning to take here and there, in some favored spot, the first steps of a civilization that was destined to spread and to rule the entire earth. The central and important stock of this North Mediterranean branch were the Aryan peoples, from which we are descended.

In early times they occupied all of Southeastern and Central Europe, and Asia to the borders of the high plateau region, probably to the banks of the Oxus flowing north into the Sea of Aral. Some of the most eastern of these peoples very early established the great Per-

sian civilization on the plateau of Iran, while others, pushing across the Hindu-Kush Mountains and spreading over the valleys of the Indus and Ganges, in the peninsula of Hindustan, laid the foundation of the ancient civilization of India.



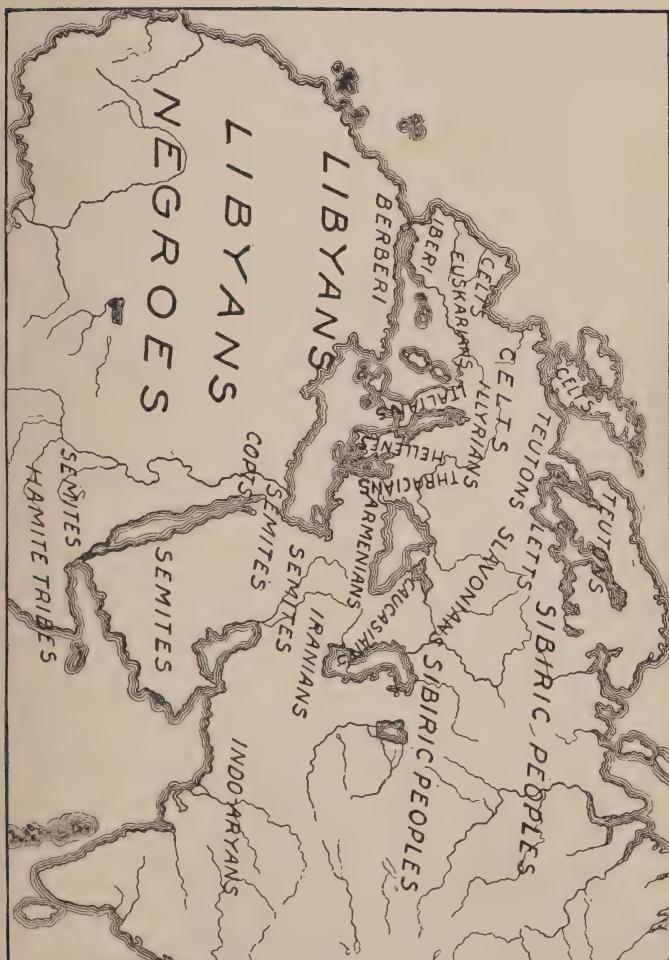
Hindu of Calcutta, Aryan. (After Quatrefages.)

The Western Aryans.—The Aryans were scattered over this broad territory as wild, wandering tribes, meeting, battling, and mingling with the South Mediterranean peoples. While the Persians and Hindus started their career of civilization in the regions where they still abide, the main body of Aryans began a

slow westward movement, barred from further progress to the East by the great mountain wall of Central Asia—the Pamir, or “roof of the world,” as it was known to the Persians.

Spreading into the Balkan Peninsula and the isles of the Ægean Sea, some of these wild tribes, after long years of struggle, developed a culture which in later time became the source and inspiration of the entire civilized world—the *Grecian Civilization*. In the mountainous peninsula of Italy the Latin-speaking peoples developed later into the great *Roman Civilization*.

Reaching to the western shores of Europe the Aryans became, in time, broken into numerous distinct peoples, speaking different languages and distributed over a wide area of country. The Keltic peoples occupied the extreme western portion and are seen to-day in the Irish, the Welsh, the Scotch Highlanders, and the inhabitants of Brittany in France. The Teutonic peoples spread over Central Europe. In Roman history the barbaric Goths and Vandals belonged to this people, also the Angles, Saxons, Norsemen, and Franks, who later became the present nations of the Scandinavian peninsula, Denmark, Germany, Holland, England, and America.



The Latin-speaking peoples, who established the civilization of Rome, and several other tribes have become extinct. The modern Spanish, Portuguese, Italian, and French peoples are the result of a mixing of several primitive folk who inhabited the region known as Gaul, and the Italian and Iberian peninsulas, in Roman times.

Another Aryan group pushing north over the plains of Russia were the Slavonic peoples, seen to-day in the modern Russians, Poles, and the inhabitants of Servia and Bulgaria.

Language. — The common ancestry of all these Aryan nations of to-day is traced largely through words used in the different languages. Many words in Latin, Greek, the Sanscrit of the ancient Persians and Hindus, German, French, Spanish, Italian, and Anglo-Saxon have, without doubt, been derived from a common root or original word, of which they still show unmistakable traces.¹

While the two main branches of the white race show their relationship by physical traits and the capability of entertaining high spiritual ideals and of reaching advanced stages of culture, the different peoples of a stock or subdivision indicate their relationship largely through language and customs.

Geographical Considerations. — The present distribution of the nations and peoples of the white race is part of history. Through all this history geographical conditions have played a very important part. The fertile valley of the Nile, surrounded on all sides by the desert, and favoring agricultural pursuits, early invited some of the wandering tribes of the region permanently to settle here. Thus were laid the foundations of a civilization the germ of which was only slumbering in the brains of these higher types of mankind.

The peculiar geography of Hindustan, a peninsula guarded from the barbarian hordes of yellow men on the north by the giant mountain wall of Central Asia, undoubtedly favored the development and continuance of the Indian civilization.

So with Rome in its infancy. The peninsula of Italy was its

¹ See "Chips from a German Workshop," by Max Müller.

guardian, and the lofty ranges of the Alps and Apennines kept back for centuries the barbarian invaders, allowing the seeds of one of the greatest civilizations to come to perfection.

The little nation of Switzerland has held its own against heavy odds in the rugged and almost unreachable fastnesses of its mountain home.

The vast steppes of Russia, traversed by such great rivers as the Volga, the Don, the Dnieper, Dniester, and others, bordered on the southeast by the Black and Caspian seas, and on the northwest by the Baltic, offered peculiar conditions for the development of a great nation in the immense territory of grass-covered plains, wide water-courses and endless reaches of forest.

The supremacy of England to-day is largely the result of its being an island separated from the continent by a strait, narrow indeed, yet broad enough to develop a distinct and characteristic nation of people. If Ireland had not been a separate island, the Irish question would probably not be agitating the nation to-day. From the fact of its being a group of islands Great Britain, in large part, owes her supremacy as a naval power, and as a conqueror in distant lands.

These examples are only a few of the many instances in man's history of the effect of geographical surroundings and their importance in influencing the destiny of nations and peoples.

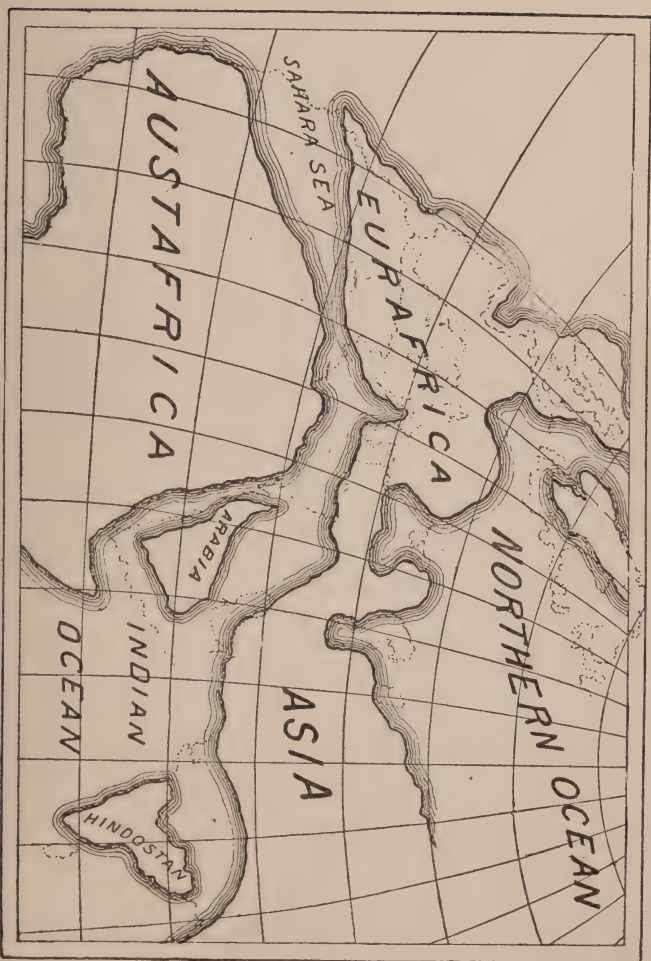
The inhabitants of the Caucasus to-day represent a few peoples that have found a refuge in these mountain valleys. The whole broad region of Europe and Northern Africa has for ages been the home of the white race. Its cradle was probably somewhere in the Western Mediterranean region at a time, ages ago, when the Mediterranean Sea was much smaller than it now is, and when two strips of land extended between Europe and Africa; one from the southern shores of Spain, and the other from the southern shores of Italy. In these parts the sea bottom now presents high ridges covered by comparatively shallow water, not more than 1200 feet in depth, while on either side of the ridges a depth of 13,000 feet has been reached. Evidently the islands of Sicily and Malta are

the exposed tops of a sunken chain of mountains that stretched from Italy into Africa. You must bear in mind that geology, which is largely the study of the past history of the earth and its relation to the present, has solved many more wonderful problems than this one of a lost land connection.¹

The climate of this Mediterranean region must have been in every way favorable to the development of the white man, and it was largely the cause of at least one of his present physical traits — *the white skin*. To-day we find two distinct types in reference to color — the blonde and the brunette, but there are endless varieties resulting from the mixture of the two. The pure blondes occur mostly in the northern peoples; the dark whites or brunettes, in the south, and this we should expect on geographical grounds.

From all the evidence thus far gathered, a geographical name has been proposed for the white race, that of *Eurafrican*, as best indicating the land of its early development and the scene of some of its greatest achievements.

¹ At the time of the very earliest appearance of man, probably in the early Quaternary, the present continent of Africa was separated by a sea from its northern portion, which formed a part of what is now Southwestern Europe. (The Atlas Mountains belong, genetically, to the same system as the mountains of Eurasia.) The Northern Ocean reached much farther south, covering what is now the low plains of Northern Europe and Asia. The peninsulas of Arabia and Hindustan were then islands, which later became a part of the main land through alluvial deposits. (See map.) It seems highly probable, from the evidence so far gathered, that the three great races of history — the white, yellow, and black — have occupied their present "areas of characterization" from an extremely remote period, and under the influence of peculiar geographical (orographical) conditions. The peoples of the white race, as seen by a study of the map on page 95, have always occupied a position between the black peoples on the South and the yellow men of Asia to the Northeast. By reference to the map on the opposite page (99), illustrating Quaternary geography, it will be seen how these areas of race characterization were isolated from one another. The present site of the Sahara Desert was a sea separating the ancient land masses of Eurafica and Austafica. The present Caspian Sea, in an area of depression below the sea level, and its neighboring salt lakes are the "evaporating lees" of that ancient northern ocean that once largely cut off a land mass of Asia to the East from the other land areas.



Outlines of the Eastern Hemisphere in the Early Quaternary (After Brinton), representing the probable relations of the land masses at the time of man's first appearance.

LESSON III. — GEOGRAPHICAL DISTRIBUTION OF THE
BLACK RACE.

READING IN CONNECTION WITH THIS LESSON.

Through the Dark Continent. — Stanley.

Hunting in South Africa. — Baldwin.

* Tropical Africa. — Drummond.

The Ruined Cities of Mashonaland. — Bent.

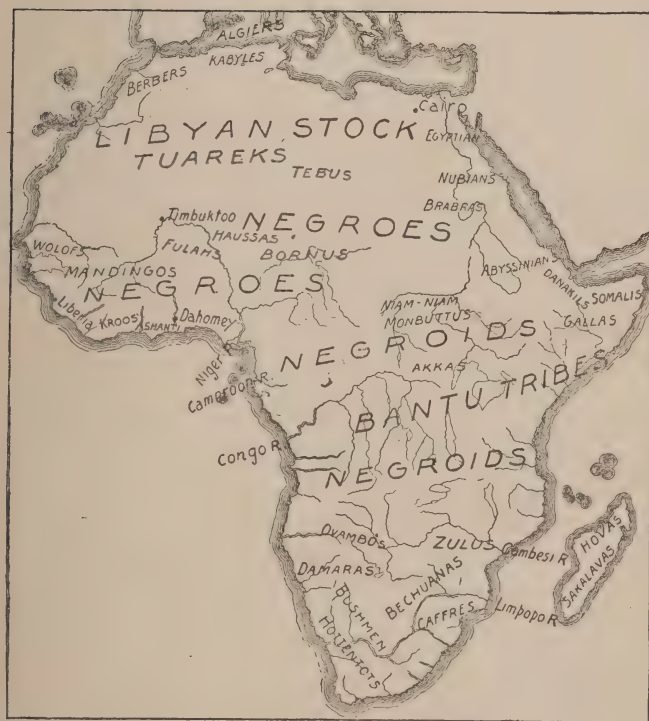
Lost in the Jungle. — Du Chaillu.

Country of the Dwarfs, etc. — Du Chaillu.

The various recent works on Africa.

Home of the Black Race. — The Continent of Africa south of the Sahara Desert is, and always has been, the home of the black man. In this territory he is divided up into numerous tribes, each occupying some definite region and, though differing in many ways from one another, all possessing the unmistakable traits of the race. These traits have, without doubt, been largely developed by a long residence in the hot, moist climate of the tropical forests of Western Africa. The more or less uniform conditions of the tropics, supplying an abundance of food with little, if any, effort in cultivation, has been an important element in keeping the black man in a state of savagery. His needs are few; warfare, hunting, fishing and the rudest kind of agriculture have always been his main pursuits, and his culture has developed only so far as these needs required.

The Physical Geography of Africa. — The western half of Africa, from the southern borders of the Sahara to beyond the Kongo, is a dense forest region. Eastward the land gradually rises into the great plateau of the continent — open, grass-covered steppes and pasture lands, broken with patches of woodland. From this elevated region rise lofty mountains and the snow-clad summits of extinct volcanic peaks as Ruwenzori, Kenia and Kilimanjaro, 20,000 feet above the sea. This highland is continued northward on the east into the mountains of Abyssinia. To the southward it becomes lower but spreads out, so that South Africa,



Ethnic Chart of Austafrican Race. (After Brinton.)

beyond the Zambesi River, is a mountainous and hilly country interspread with grass-covered plains, belts of forest, and arid deserts.

In the high portions of eastern equatorial Africa a group of remarkable fresh-water lakes or inland seas occurs—Victoria, Albert, and Albert Edward Nyanza, Tanganyika, Nyassa, Bangweolo, and many others of less importance. These lakes are the feeders of gigantic water-courses that traverse the continent north, west, and east. The Nile flows north from the Nyanza group, emptying into the Mediterranean Sea. The Kongo flows westwardly into the Atlantic, while the Zambesi, rising in the mountains of the south central part of the continent and receiving the Shire, an important tributary from Lake Nyassa, empties into the Indian Ocean. South of the Zambesi the Limpopo River likewise empties into the Indian Ocean, while still farther south, the Orange or Gareep River pursues a westerly course to the Atlantic.

The great forest region of the West coast is drained by a remarkable river, the Niger, emptying into the Gulf of Guinea; while still farther north, the Senegal flows into the Atlantic Ocean.

African Zoölogy. — The African Continent is the home of a vast number of large and peculiar animals, many of them being found nowhere else on the earth. Two large, man-like apes, the gorilla and the chimpanzee, are found in the dense forests of the western part. Great herds of antelope, of many kinds, roam over the pasture lands of East, Central, and South Africa. Zebra and giraffe, the two-horned rhinoceros, the hippopotamus, a species of elephant, the lion, the leopard, and several species of hyena are some of the characteristic animals. All these are being driven farther and farther into the heart of the continent before the steady advance of the white man. The 'big game' of Africa is destined, before many years, to disappear from the face of the earth.

Bird-life is here remarkably rich in peculiar forms. The ostrich roams over the open lands and desert tracts of the entire continent. The curious secretary bird, feeding upon serpents, the



Relief Sketch. Map of Africa (Lambert's projection).

guinea hen, bee-eaters, sun-birds, weaver birds, kingfishers, parrots, and a host of other more or less remarkable forms, besides flocks of water-fowl, swarming along the great rivers, add to the wonderfully rich and peculiar life of this strange land.

Among reptiles, the crocodile of the various African rivers is the most remarkable. Fishes are found in great abundance, and insect life reaches a wonderful development in variety and numbers.

African Landscapes and Vegetation. — The features of an African landscape depend largely upon the character of the vegetation in the different parts of the continent. Throughout the desert region the date palm forms a characteristic feature. South of this dry belt the date disappears, and the effect of the tropical rains coming in from the Atlantic marks the great forest region with its rich and varied forms of plant life. Here occur the baobab, the giant cotton trees, the oil and sago palms, the golden-flowered laburnum, and the papyrus plant of the river shores and swamps. Among food plants the papaw, ground nut, manioc, pigeon pea, custard apple, plantains, and tamarinds are conspicuous.

In the higher, more open regions of the eastern and southern portions of the continent the heaths are found in great abundance, also the euphorbias, mimosas, and many singular tribes; while in the arid desert tracts occur curious fleshy plants like the aloes and melons. In every part the vegetation forms a striking feature of the African landscape.

African Tribes and Peoples. — Over this great region, with its remarkable animal and plant life, the black race is distributed, being broken up into numerous tribes in the different parts of the continent. Three main branches of the race are recognized: the *true Negroes*, the *Negroids*, and the *Negrillos* or *dwarfs*.

The *true negroes* inhabit the dense forests of Guinea and Senegambia in the west, extending eastward through the Soudan or "Land of the Blacks" to the Nile Valley. They consist of numerous tribes scattered throughout this region, which is divided into various kingdoms. Hunting, fishing, tilling the soil and war-

fare are the principal occupations of these peoples and some of them, like the Fans of Guinea, are cannibals. The western part of this region and the Guinea coast were for years the seat of the slave trade, whence thousands of negroes were shipped across the sea to America.



A Negro Type, Ouali Sérère. (After Quatrefages.)

The *Negroid* peoples are probably the result of a mixture between the true negroes and some of the Semitic members of the white race inhabiting North and East Africa. This mixing of the two opposite races along their line of contact, the middle Nile Valley and northern borders of the Soudan,

must have been begun at a remote period and kept up closely for a long time, as the Negroids are now a well-marked branch, split up into numerous tribes. The tribes inhabiting Nubia, the high grass-lands of East-central Africa (the great lake region and upper Nile basin), the immense territory embraced by the water-sheds of the Kongo and Zambesi; the Kaffirs, Zulus, Bechuanas, and numerous other peoples of the Bantu group in the south all belong to this Negroid stock. They differ quite markedly from the true negro, being in many ways more advanced, and when inhabiting the open grass country they lead a more or less pastoral life.

The *Negrillos* or dwarfs are a little people. Some tribes dwell in the dense forests on the northern side of the Congo. They are expert elephant hunters, and engage also in hunting, constructing

pitfalls for game, etc. In South Africa these little folk are again found as the Bushmen, one of the lowest tribes of mankind, dwelling on the borders of the great Kalahari Desert ; and the Hottentots, somewhat larger in stature and much more intelligent, being probably the result of a mixture of Bushmen with some of the Negroid peoples of the region.

The Kalahari region is not a desert in the general sense of the word, but a waterless waste of country overgrown with thickets of mimosa and camel's thorn which send their roots deep down into the soil in search of water. The Bushmen are very expert in finding the presence of water, often at a considerable distance below the surface. They feed on snakes, lizards, insects, and roots, and build grass huts for shelter over night.

Effect of Arab Invasion. — The Arab of the white race has long held sway over a wide portion of Africa. He carried the creed of Islam, or Mohammedanism, into many of the native tribes, and through his influence populous cities arose in several negro kingdoms. Prominent among these is Timbuctoo, on the banks of the Niger, built of sun-dried bricks and containing a population of 20,000 souls. The influence of the Arab, however, was not for good. As a trader in slaves and ivory, he has spread terror over a vast extent of country. Tribe after tribe has fallen into his hands, and the net-work of well-worn paths leading from the interior to the shores of the Indian Ocean, on the Zanzibar coast, are continually traversed by long caravans of wretched captives loaded down with ivory.

The Future of Africa. — To the European the climate of many parts of Africa is deadly in the extreme. It is especially so in the low river valleys and along the coast where dense vapors abound, loaded with malaria and the fever poison from decaying vegetation. Until this element is overcome by long residence and gradual acclimatization the condition of Central Africa must remain much as it is to-day, and has been for centuries. In the South, colonization by the white man has advanced rapidly. The only possible hope of checking the Arab slave-hunting raids

in the interior is from the gradual extermination of the elephant. When this is accomplished, the question of ivory from this source will be at an end and one of the main causes of the slave trade removed.

Geographical Name of the Race. — The black man is distinctly a native of the southern half of the African Continent. The term Austafrican race has, therefore, been proposed, the word 'aust,' from *austral*, meaning south, indicating the land of his birth, characterization, and present distribution.

LESSON IV.—GEOGRAPHICAL DISTRIBUTION OF THE YELLOW RACE.

READING IN CONNECTION WITH THIS LESSON.

Central Asia. — Bayard Taylor.

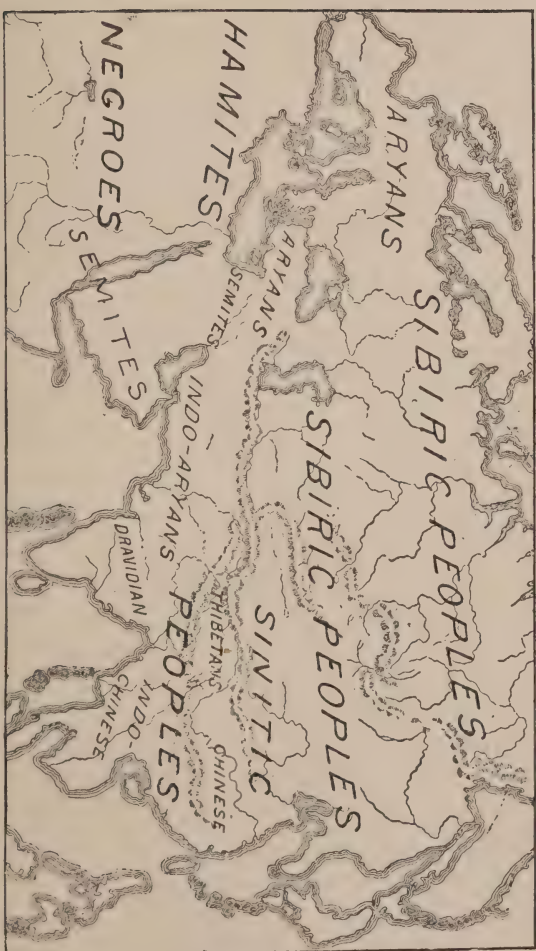
Japan. — Bayard Taylor.

Tent Life in Siberia. — Kennan.

Land of the White Elephant. — Vincent.

Roof of the World. — Gordon.

Home of the Yellow Race. — The great land mass of Asia east of the river Oxus or Amu Darya and north of the Pamir, and the immense territory of Arctic Europe and Siberia, is the home of the Yellow or Asian race. From time immemorial the yellow man has occupied this area of the earth, and its peculiar physical conditions must have set their stamp upon him at a very early period, for we find him at the beginning of history occupying this same region with the same physical characters of form and feature that we see to-day. Like the black man, the yellow man has remained much the same in intellectual development and culture as when he first appeared on the historic scene. The great and often rapid changes toward a higher culture that mark the career of the white man, are as strikingly absent in the yellow as in the black race, though the yellow man under peculiarly favorable conditions early reached a form of civilization which has not advanced beyond a certain step in centuries. The reasons



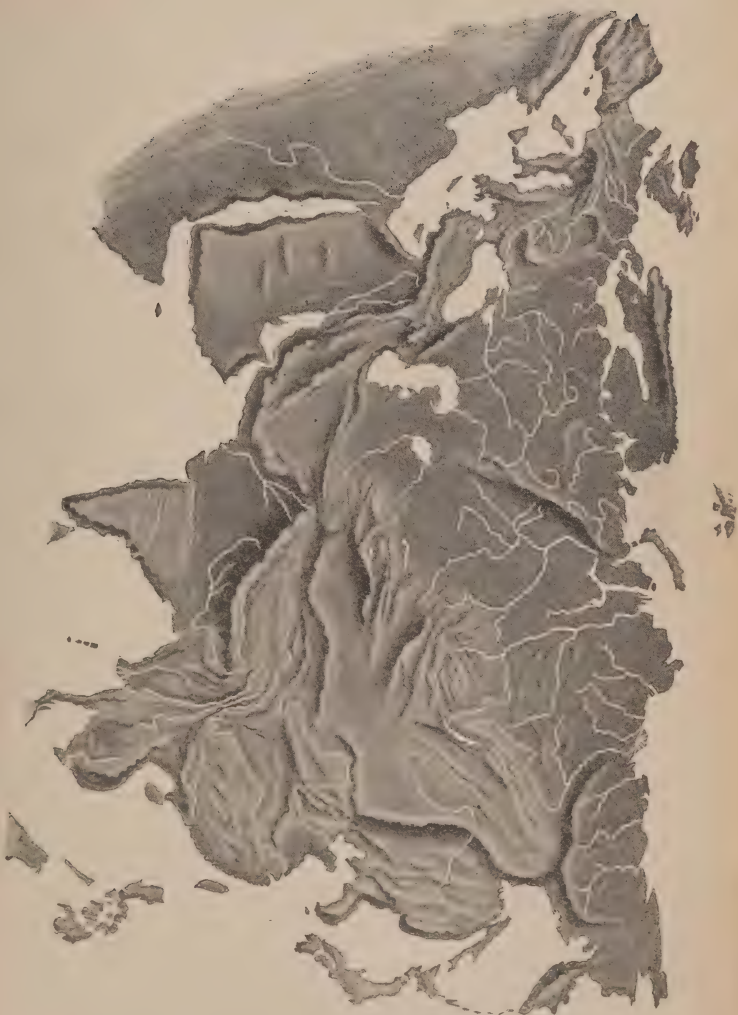
Ethnic Chart of Eurasia and Asia. (After Brinton.) Asia proper, strictly speaking, includes the high mountainous portion east of the Pamir, the Siberian Plains, and the low, tropical lands of India, Farther India, China, and the outlying groups of islands.

for this arrested development are to be found largely in the geographical surroundings of the yellow race which, though totally unlike those of the black race, have had a somewhat similar effect in checking any tendency toward advancement of culture. It is a striking fact that any elevation in the members of either race has come from contact with the white man and his broadening influence. This is especially true in later years of the more civilized Chinese and Japanese.

Physical Geography of Asia. — The surroundings of the yellow race, except in a few favored river valleys and tropical coast regions, are largely of a forbidding character. Two prominent features mark the geography of Asia: to the south is a series of mountain-rimmed plateaus of great elevation; and stretching north of this highland, to the shores of the Arctic Ocean, is a vast expanse of level plain, consisting of extensive marshes, forests, and grass-covered steppes. These two features are known as the *Central Asian Plateau* and the *Great Siberian Plain*.

The Central Asian Plateau. — East of Persia or Iran the land mass of Asia rises into a lofty ridge, the Pamir or 'roof of the world,' 15,000 feet above the sea. Running westward from the southern corner of this is the great Hindu-Kush range, connected by numerous ranges with the Elburz Mountains south of the Caspian Sea, and so on through the Caucasus with the mountain ranges of Europe. Eastward from the Pamir two great mountain ranges extend to the Pacific Ocean. The one to the north is the Thian Shan, continued northeastwardly to the Sea of Okhotsk by such broken ranges as the Siansk, Altai, Khinghan, Stanovi, and numerous others.

The great mountain wall to the south, reaching quite to the Bay of Bengal, is the far-famed Himalaya range, containing throughout its length some of the most remarkable mountain peaks on the earth. Among these is Mount Everest, 29,000 feet above the sea, and as far as known, the highest peak in the world; Kanchinjinga, near the village of Darjeeling, and many others



Relief Sketch. Map of Eurasia (Lambert's projection).

NOTE. — The Amur River does not break through the Khingan mountain range, as the map would indicate, but curves around its northern shoulder. The mountain range itself is broken to the north, and is not a continuous wall, as represented by the map. — S. T.

almost as high.¹ These two great ranges, the Himalaya and Thian Shan, inclose a triangular table-land of immense height, its base reaching far to the northeast. The southern portion of this table-land is much higher than the northeastern and is separated from it by a range of mountains running nearly parallel with the Himalayas—the Kuen Luen range. This high, southern portion, lying between the Himalayas and Kuen Luen ranges, is the Plateau of Thibet. Across its surface, from west to east, runs another high range of mountains parallel with the others—the Karakorum.² The northeastern portion of this table-land, between the Kuen Luen and Thian Shan, is the great Mongolian Plateau traversed by numerous mountain ranges and divided into two portions—the desert region of Eastern Turkestan to the west, and the Shamo or Gobi desert to the northeast.

Lowlands.—On all sides of this elevated plateau the land falls away: to the south and east into the tropical peninsulas of Hindustan, Farther India, and the lowlands of Southern China; to the west into Turkestan and the depression about the Caspian Sea; while to the north it passes into the great Siberian Plain. This vast expanse consists of stretches of pine forests interspersed with open country in the south, while to the north the characteristic *tundras* or marshy lands, broken here and there by low, straggling mountain ranges, extend to the shores of the Arctic Ocean.

Drainage.—Numerous large rivers rise in the mountains of the central plateau region and flow in all directions toward the sea. To the south, in Hindustan, the Ganges, and its great tributary the Brahmaputra empty into the Bay of Bengal, while the Indus flowing southwestwardly empties into the Arabian Sea. From the eastern spurs of the mountain region flow the two great rivers of China—the Yang-tse-kiang and Hoang Ho, emptying into the Pacific. Farther to the north, from the Mongolian Plateau, the Amur River flows eastward into the Pacific. The Oxus and Jaxartes, rising in the neighborhood of the Pamir, flow north-

¹ The highest mountain is now thought to be Deodhunga, one of the Himalayas, 29,002 feet. ² The Karakorum Mountain range does not reach across Thibet as an unbroken chain. The range bearing this name is, in reality, a gigantic spur of the Himalayas jutting out from the Pamir, and as such is known as the Karakorum Himalayas.

westwardly into the Sea of Aral, while northward across the Siberian Plain from the northern mountain ranges those great water ways, the Obi, the Yenisei, and the Lena, flow into the Arctic Ocean.

Climate. — The climate of this great region is one of extremes, burning hot in summer, and in winter cold almost beyond description. Along the low eastern and southern coast lands and peninsulas of Asia a tropical climate prevails throughout the year.

Peoples of the Asian Race. — The great Siberian Plain reaches westward into Europe and extends on the south to the shores of the Black Sea, and northwestwardly to the Baltic, embracing all of Russia, and the lowlands of Central Europe. This geographical feature is of great importance when we consider the distribution of the Asian race.

The race, as a whole, presents two primary and well-marked geographical divisions, into one or the other of which all the different tribes and peoples fall. These divisions are known as the *Sinitic* and *Sibiric branches*.

The Sinitic Branch. — The Sinitic branch comprises the inhabitants of High Asia, from the Pamir eastward across the Plateau of Thibet, also those of China and the peninsula of Farther India. The religion of nearly all these peoples is that of Buddhism, a material and mystical belief in which the higher faculties of the mind are developed, but not a spiritual worship in the true sense of the word.

The inhabitants of the lofty, mountain-rimmed Plateau of Thibet form an isolated group, partially civilized, leading a pastoral rather than an agricultural existence, but mainly given over to a religious life. Buddhism finds its most devoted followers among these peoples, thousands of them leading the life of monks and *lamas*, or priests, in the holy city of Lhasa and the monasteries scattered here and there in the fastnesses of the mountains.

The Chinese have reached a rather advanced state of civilization that is largely the result of their geographical surroundings. The fertile valleys of the Hoang Ho and Yang-tse-kiang — streams

flowing from the hill country and mountainous regions through low flood plains to the sea ; the temperate and tropical climates of the northern and southern portions ; and the high mountainous deserts barring China off from the rest of the continent, have all tended to foster the conditions of culture leading to civilization. China was long excluded from the rest of the world by its peculiar position. The people were for a long time averse to foreign intercourse, but this feeling gradually gave way to the outside influence exerted by the white man. To-day the Chinaman, with his oblique, almond-shaped eyes, his yellow skin and straight pig-tail, his shuffling gait and " Pigeon English " talk, is in lands far away from the Celestial Empire. His arts and products are in every country, and Peking, Nan-King, Canton, and Hong-Kong are marts and cities of the world. The great wall of China was built, 214 B.C., in order to protect the country from the once frequent inroads of the barbarian hordes of Mongolia that several times threatened the life of the empire.

The inhabitants of the several countries forming the peninsula of Farther India — Burmah, Siam, Annam, Cochin China, Tonquin, and Cambodia — belong to the Sinitic branch of the yellow or Asian race. Some of these people show traces of admixture with peoples of the other two races, though the Asian traits predominate. They have reached a certain degree of civilization, and this is especially true of the Burmese and Annamese.

The Sibiric Branch. — The terms ' Sinitic ' and ' Sibiric ' indicate roughly the geographical relations of the two main branches of the Asian race. The first is derived from the old Greek name for China, the Chinese being the typical members of this group.



Young Japanese girl—Asian type.
(After Quatrefages.)

Sibirie is derived from the name 'Siberia,' this great territory being the center of distribution of the various peoples comprised under this head. The Sibirie peoples are spread north of High Asia from the Pacific Ocean to the Black Sea and the Baltic. At one end of this extensive area, on a group of islands lying off the eastern shores of Asia, are the Japanese peoples, the most highly civilized of the Asian race. At the southwestern corner, in the neighborhood of the Black Sea, is the great Ottoman Empire, occupying the country known to-day as Turkey and in ancient times as Asia Minor. Six distinct groups of this Sibirie branch are more or less clearly defined as to their geography.

1. The *Japanese* group already mentioned, which, according to tradition, appear to have come to the islands from the mainland at a remote period, and to have displaced a ruder race, the Anios,



Chukchis — Asian type—Arctic group. (After Quatrefages.)

a remnant of which still inhabits the northern islands of Japan. The inhabitants of the peninsula of Korea are closely related to the Japanese, belonging to the same group of peoples.

2. The *Arctic* group of peoples comprise numerous rude, barbarous tribes living in Kamchatka and Northeastern Asia, between the Arctic Ocean and the Pacific. The Chukchis, the Kamchatkans, the Koraks, with their herds of rein-

deer, the Namollos of East Cape, the Ghiliaks of Saghalien Island, and the Anios of Northern Japan belong to this group.

3. The *Finnic* peoples, as the present Finns and Lapps of Finland and Lapland in Arctic Europe; the Samoyeds, and other tribes inhabiting Northern Siberia, the regions about the great river valleys and Lake Baikal.

4. The *Tungusic* group inhabiting the country known as Manchuria, from China north to Kamchatka, and from the Yenisei Valley to the Pacific. This group consists of two peoples—the Manchus, a somewhat superior tribe, who gained possession of the Chinese throne about two hundred years ago, and still continue to govern the great empire, and the Tungus, a ruder people, living to the north in the great wilderness of swamp, mountain, and forest.

5. The *Mongolic* group, whose original home was in the desert wastes of the Mongolian Plateau, south of the Altai Mountains, and extending eastward to Manchuria. The group comprises the present warlike and roving Kalmucks—the true herdsmen of the Steppes—extending from Lake Baikal to the Volga River in Russia, and the present inhabitants of Mongolia. The Mongolian has played an important part in the history of the past. In barbarian hordes, under such famous leaders as Genghis Khan, Tamerlane, and Baber, he has from time to time swept the continent of Asia, leaving ruin in his wake. The last-named leader once held India under the empire of the Great Mogul (Mongol).

6. The *Tataric*¹ group found their original home in Turkestan, north of the Pamir. From this point, at an early date, they spread as barbarians east, west, and south. At the fall of Rome they swept westward into Europe under Attila, the “scourge of God.” Of their descendants to-day we have the Turks, a Mohammedan people ruling Turkey in Asia and Europe; the Cossacks and Kirghis of the Steppes; the inhabitants of Bulgaria and Hungary in



Maudchon—Asian type. (After Quatrefages.)

¹ Frequently, but incorrectly, spelled *Tartar*. It is derived from the Chinese word *ta-ta*. *Tu-kiu*, another Chinese name, is the origin of our word, “Turk.” (Brinton.)

Europe, and other less prominent peoples. Turkish dominion, embraced under the Ottoman Empire, includes also Syria and Egypt. It recognizes the Sultan as its head, and as the political power of the entire Mohammedan world.

Effect of Geographical Features in the History of Asiatic Peoples.—The white race, as we have already seen, occupies only a small portion of Asia proper—the peninsulas of Arabia and Hindustan and the plateau of Iran or Persia. Between Persia and Hindustan lie the two small countries of Afghanistan and Beloochistan, peopled by branches of the Indian stock. The civilization reached by these Asiatic members of the white race, though inferior to European culture, is vastly superior to any civilization of the Asian race. While Mohammedanism prevails in Persia from its close geographical relations with Arabia, a nature worship, called Brahminism, and Buddhism are the religions of India. Buddhism had its origin in India, spreading thence to Farther India, Thibet, Central Asia, and China, so that the religion of the Asian peoples had its source in the white race. To-day the votaries of Buddha far exceed in numbers any other religious sect in the world.

The decision of the question of supremacy in the East between the powers of England and Russia lies largely in geographical conditions. England's empire in India and Russian power on the frontiers of Afghanistan are separated by the Hindu-Kush and outlying ranges, and, if war be the issue, the Khyber Pass must largely decide the result.

The destiny of Asia lies in the hands of the ever-conquering, all-possessing white race. Russia or England will decide the fate of the Turkish Empire and its Sultan, and all because the plains and rivers of Russia reach to the Black Sea, and ships from the Mediterranean may enter its domain through the Dardanelles and the Bosphorus. The Russian Government is now laying one of the greatest railroads of modern times across the wastes of Siberia from the Baltic Sea to the Pacific Ocean, and the barbarians of Asia are destined to disappear before this greatest of civilizing influences.

LESSON V.—MAN IN AMERICA.

READING IN CONNECTION WITH THIS LESSON.

The Andes and the Amazon. — Orton.

A Thousand Miles' Walk Across South America. — Bishop.

* Conquest of Peru. — Prescott.

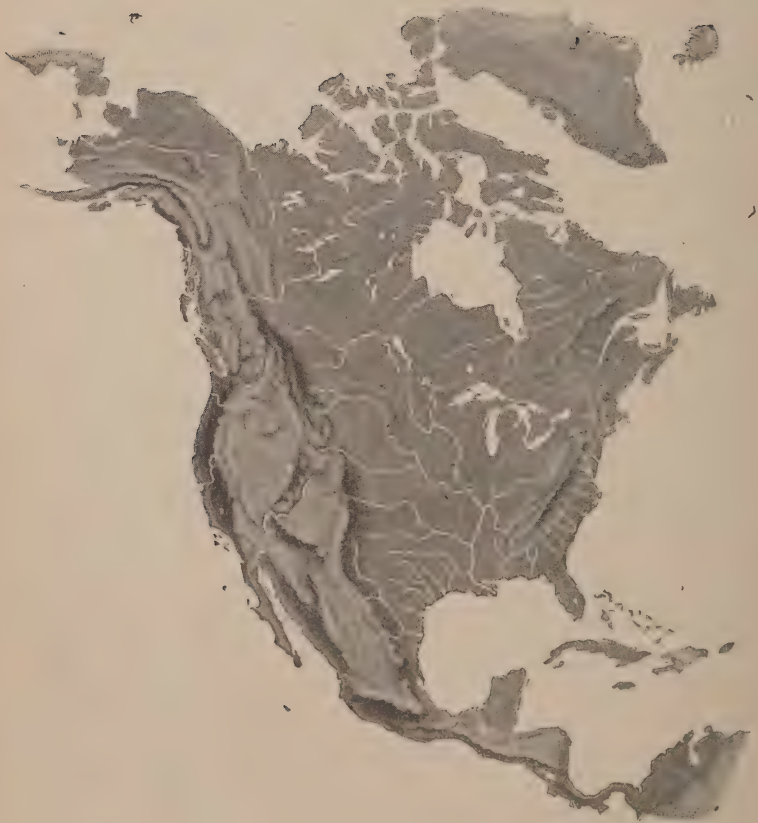
* Conquest of Mexico. — Prescott.

* Nature and Man in America. — Shaler.

Our Arctic Province. — Elliott.

The Red or American Race. — The white, the black, and the yellow races are the races of history. With the discovery of America a new race appeared upon the scene. Men of a *red* or *coppery* color, with *straight* or *wavy hair* and *medium nose*, leading for the most part a savage life, though, in some instances, possessing a culture hardly inferior to that of many of the white peoples. The peoples of this Red or American race became known to the world as *Indians*, a name which they still hold, from the fact that Columbus, when he landed on the now historic island of the Bahama group, believed that he had reached India by sailing westward around the earth.

Broken into numerous tribes and peoples throughout the entire extent of both North and South America, the red man everywhere presents the same physical features which at once distinguish him from the other races. His origin is obscure. He has been an inhabitant of the American Continent long enough to have had his peculiar race traits indelibly fixed by the geographical conditions of the country and climate. The red man undoubtedly came from Eurasia at a very remote period, probably in that first general migration from the original home which carried man to all parts of the earth, and brought about the different races as we have already noticed. By what route he came it is difficult to determine, some authorities believing that it was from Asia by way of Behring Strait, others from Europe



Relief Sketch. Map of North America (Lambert's projection).

at a time when more or less of a land bridge existed between Europe and Arctic America and Greenland. Some writers, from some points of resemblance in his features, have claimed for him a descent from the Asian race. However this may be, the red man or Indian of to-day is both physically and geographically a distinct race — the *American*.

Culture. — The North American Indian leads the life of a savage hunter. Throughout the continent, when first discovered, the various tribes practiced a number of rude arts, pottery, the fashioning of weapons and implements of the chase, and the cultivation of maize and tobacco about their wigwams. In Central and South America remarkable civilizations had developed among some of the tribes, and cyclopean ruins of wonderful design show that architecture had reached a high degree of perfection.

Although the largest number are savages, an ideal religion has always existed among them, the worship of 'spirits' being almost universal throughout the various tribes in both North and South America.

Physical Geography of the American Continents. — The general outline of the land mass of the Western Hemisphere naturally divides it into two large continents connected by a third, much narrower, portion. The first of these, or North America, is characterized by regions of widely different aspect. By far the largest area is forest-clad, a vast wooded land in the eastern half stretching, at the time of the discovery, from the northern limit of trees in the far northwest to the mouth of the Mississippi River. West of this is the region of the great plains, rolling, grass-covered steppes, dry and treeless, except along the river bottoms. To the west these plains gradually rise into a great plateau region, crowned by the lofty ranges of the Cordilleran system. Between the Rocky Mountains and the Sierra Nevada ranges is the Great Basin, a dry, alkaline region covered with sage-brush and with numerous salt lakes and marshes which are the evaporating lees of an ancient inland sea. On the Pacific slope a forest region again prevails.



Relief Sketch. Map of South America (Lambert's projection).

Arctic America, north of the forest limit, is a barren stretch covered with a stunted vegetation. To the extreme north the land is broken into an archipelago of numerous islands separated from Greenland by Baffin's Bay and the narrow channels leading toward the North Pole. The Rocky Mountain system stretches from Alaska in the extreme northwest to the highlands of Mexico. The coast lands of Mexico are low and tropical in character, and this condition becomes more and more pronounced as we travel southward. The mountain ranges become insignificant, and in the peninsula of Yucatan, in Guatemala, in Nicaragua, and on the Isthmus of Panama the vegetation, scenery, and climate are wholly tropical.

In that part of the Atlantic Ocean known as the Caribbean Sea, between the Gulf of Mexico and the northern shores of South America, lie a great number of volcanic and coral islands known as the Greater and Lesser Antilles, or the West Indies, comprising the islands of Cuba, Hayti, Jamaica, the Bahamas, Windward and Leeward Islands, Trinidad, and numerous others.

The Isthmus of Panama joins Central America with the northwest corner of the South American Continent, and the low mountain ridges almost immediately rise into the lofty chain of the Andes, stretching along the western or Pacific side to Cape Horn. In this great Cordilleran or Andes chain is to be found some of the grandest scenery in the world. A magnificent tropical vegetation covers the mountain slopes and valleys, while rising thousands of feet into the air tower numerous volcanic peaks, many of them active and covered with perpetual snow.

The eastern portion of South America, like the western portion of Africa, is low and covered with a dense tropical forest, a result of the moisture-laden trade winds of the Atlantic. This forest region is of vast extent, stretching from the eastern base of the Andes to the Atlantic, and south to the Rio de la Plata. South of this great river the open, grass-covered plains or pampas reach to the narrow, mountainous end of South America, known as Patagonia, ending at the Straits of Magellan. This narrow strip of

water separates the continent from the Island of Tierra del Fuego, at the southern termination of which is Cape Horn, jutting out between the icy waters of the South Atlantic and South Pacific oceans.

Rivers. — In the eastern wooded region of North America the low ranges of the Appalachian Mountain system run north and south. These act as a divide to the numerous streams flowing into the Atlantic Ocean on the one hand, and into the great Mississippi system of drainage on the other. In the same way the Rocky Mountains part the streams flowing east into the Mississippi from those going west toward the Pacific. The Mississippi is the great central drain of the continent, flowing into the Gulf of Mexico. East of its source a remarkable chain of fresh-water lakes occurs, finding an outlet to the Atlantic through the St. Lawrence River.

North of the source of the Mississippi is a low range of hills called the 'Height of Land,' separating streams that flow north into Hudson Bay from southward flowing waters.

A number of large lakes are scattered through the northern portion of the continent, and several rivers of considerable size flow into the Arctic Ocean.

In South America three great rivers rise in the Eastern Andes and flow across the long slope of land to the Atlantic. The one farthest north, the Orinoco, flows, for part of its course, through open, grassy plains or 'llanos.' The Amazon, the largest stream in the world, flows across the continent at about its broadest part, through a dense forest region called the 'selvas,' while to the south is the great Rio de la Plata. These three rivers are very near one another at their head waters, and the Amazon and Orinoco are connected by a stream called the Cassiquaire. Only a few mountain torrents flow into the Pacific on the western side of South America, the steepness of the slope leaving but a narrow fringe of level coast land.

Tribes and Peoples of the American Race. — The peoples of the American race fall very naturally into seven geographical groups. 1. The *Arctic Group*, comprising the Eskimo tribes and the inhabitants of the Aleutian chain of islands, stretching from the

southern coast of Alaska almost to Kamchatka. The Eskimo peoples are spread from Icy Bay in Alaska eastward across Arctic America into Greenland. They are for the most part seafaring, engaged in hunting the walrus, seal, narwhal, polar bear, and other arctic animals. They depend on their packs of dogs to carry them in sledges over the land-ice and frozen seas of their desolate home. Unlike many of the Northern Asiatic tribes, they have not domesticated the reindeer which, along with the curious musk sheep, abound in this region, but they hunt these animals for their skins and flesh. Their 'kayaks' or sea-canoes, made of seal skins stretched over frames of wood or bone, are models of skillful workmanship, as are also their various hunting and fishing implements, made of wood, bone, and ivory. They live in snow houses, and it is interesting to note that the arch or dome-shape of these dwellings was an idea of their own.

2. *The North Atlantic Group* comprises all the Indian tribes of North America from the Atlantic west to the Rocky Mountains, and south of the Arctic peoples. In other words, they occupy the vast territory drained by the rivers flowing into the Atlantic Ocean, either directly, or through Hudson Bay, and the Gulf of Mexico. The eastern stocks, like the Algonkin and Iroquois tribes, have long since disappeared. The Northern or



Gray Eagle — Apache — American type.
(After Quatrefages.)



Indian Tribes of the United States. (After Brinton.)

Athapasca stock, known among its members as Tinnéh, "people," and by the Algonkins as Chepewyans, or "pointed skins," from the shape of the skin robe which they wore, was at one time widely dispersed from Hudson Bay to the Arctic Ocean, and west almost to the mouth of the Yukon River in Alaska. Some of their tribes that wandered south are the present Apaches and Navajos of the southwestern United States. The Dakota stock, better known to-day as the Sioux tribes, at one time spread from Lake Michigan to the Rocky Mountains, and from the Saskatchewan River on the north to the Arkansas River on the south. The now civilized Choctaws, Cherokees, Chickasaws, Creeks, and Seminoles formerly occupied the present area of the Gulf States, from the Mississippi to the Atlantic. The Creeks are thought to be the descendants of the curious people called 'Mound Builders,' who have left their strange earth-works in the Ohio Valley. The 'Plain's Indians' of to-day, outside of the Sioux tribes, are mostly descended from two stocks—the Caddoe and the Shoshonee. Of the former are the Pawnees and Kioways; of the latter, the Utes and Comanches. Most of the Plain's Indians are expert horsemen, having domesticated the descendants of the horses that ran wild after the Spanish invasion by Cortez.

3. *The North Pacific Group* includes various tribes from Mount St. Elias, on the north, to Mexico and Lower California. In the north they have always been mostly hunters and fishers, but, in the south, such tribes as the Pueblo Indians and the Cliff Dwellers of Colorado, New Mexico, and Arizona reached a considerable degree of culture, the evidence of which is seen in their remarkable stone dwellings, pottery, and clothing.

4. *The Mexican Group* includes the famous Aztec civilization, remains of which are still seen in the wonderful ruins of architecture, and in the manufactures and implements which they used.

5. The *Central American Group* of people living between the Isthmus of Tehuantepec and the Isthmus of Panama are known as the Mayas. They are to-day degenerate descendants of a once

highly cultured people, who have left striking evidence of their architectural skill in the numerous ruins of monuments and fortifications scattered throughout the region.

6. The *South Atlantic Group* comprise the former inhabitants of the West Indian Islands, the forests of the Orinoco, Amazon, and La Plata, known as Caribs, Tupis, Arawaks, etc., and the tribes descended from them. Belonging to this same group are the roving peoples of the pampas, the Indians of Patagonia, and the natives of Tierra del Fuego.



Teresa Capac — Peruvian. (After Quatrefages.)

7. The *South Pacific Group*, or the ancient dwellers along the Andes Mountains, had reached a remarkable civilization at the time of the Spanish Conquest. These people were the Incas or Qquichua tribes of Peru.¹ They cultivated various plants; had a system of canals for carrying water; built temples of wonderful design and structure and domesticated the llama, a peculiar animal of that mountainous region. From the wool of this creature they wove various cloths, and this same wool forms the basis of the

material known to-day as 'alpaca.' They were skillful workers in gold and various metals, and in pottery of the finest character; understood the embalming or mummifying of the dead, like the ancient Egyptians, and possessed advanced forms of worship and government. All this splendor of civilization was cut short by the bloody conquest of the Spaniards under Pizarro.

South of the great Peruvian civilization, in the mountains of Chile, lived the Araucanians, a warlike and hunting people, related to the tribes of the pampas, though of superior intelligence in consequence of contact with the Incas.

¹ The term *Inca* referred to the rulers. *Qquichua* was the language spoken.



Relief Sketch. Map of Malay Archipelago, Australia, and adjacent islands. The white shows area of submarine plateau (thousand-fathom line) ; the black, oceanic deeps.

LESSON VI.—ISLANDERS AND COAST PEOPLES.

READING IN CONNECTION WITH THIS LESSON.

The Malay Archipelago. — Wallace.

Coral Islands. — Dana.

Among Cannibals. — Lumholtz.

Island Geography. — From the southeastern shores of the Malay Peninsula a chain of islands extends almost to Australia. Sumatra, Borneo, Celebes, Java, and its group of smaller islands, the Moluccas or Spice Islands, Timor, Ceram, New Guinea, and a host of smaller ones are all more or less mountainous and volcanic islands with low, coral-fringed shores and covered with a luxuriant tropical vegetation. Immediately to the north of these lie the Philippines and Formosa, of much the same character, while south of the peninsula of Hindustan is the island of Ceylon. In the Indian Ocean, east of Hindustan, are two small groups, the Andaman and Nicobar islands. Off the east coast of Africa is the large island of Madagascar with its outlying groups, the Mauritius, Seychelles, and Comoro islands. South and east of the island continent of Australia lie Tasmania and New Zealand, while a vast area of the Pacific Ocean north and east of this is dotted with a multitude of islands and island clusters, or archipelagoes, the entire region being known as Polynesia or Oceania. Among the more noted of these island groups are the Salomon, Caroline, Ladrone, Pelew, Marshall, Gilbert, Sandwich or Hawaiian Islands, Samoa or Navigators, Fiji, Friendly, Society, and Low Archipelago, besides hundreds of other less noted and conspicuous islands and clusters. Many of these islands are coral formations, built on sunken volcanic mountain ridges, and rising out of a deep sea. They are mostly covered with a luxuriant tropical vegetation.

These islands are all inhabited by peoples which, though very

different in many respects from one another, all possess certain physical traits, which point to a common origin and a more or less close relationship, though now separated by wide stretches of ocean.

Physical Traits of Island Peoples. — These physical traits are a dark shade of color, wavy or frizzly hair, and medium or narrow nose. Some of these peoples show a decided likeness to certain Asiatic types, while others resemble the black peoples of the African continent. Based on these physical characteristics and their relationships, we can divide them into three main branches or stocks, — the Negritic, Malayic, and Australic.

Distribution. — 1. The *Negritic* stock includes the inhabitants of the Andaman and Nicobar islands, the tribes inhabiting Malacca and the Philippines, the Papuas of New Guinea, and the natives of the Fiji and Loyalty islands, New Caledonia, New Hebrides, etc. The physical aspects of many of these peoples are strikingly like some of the black tribes of Africa. Some, like the Papuas, are low in the scale of development, unacquainted with even the bow and arrow. Others, again, like the Fiji Islanders, have reached a considerable degree of culture.



Javanese — Island type. (After Quatrefages.)

2. The *Malayic* stock includes the Malays of the Malay Peninsula, or Malacca, and Sumatra; the natives of Java; the Dayaks or 'head hunters' of Borneo; the Macassars of Celebes; the Tagalas of the Philippines; the Hovas of Madagascar; and the Polynesians, Micronesians, and Maoris, spread over that vast

expanse of coral sea from the Sandwich Islands, on the north, to New Zealand, on the south. Though rude and savage by nature, many being cannibals, some have attained a remarkable degree

of culture. Arts of various kinds have reached more or less perfection ; a belief in many gods, or polytheism, is prevalent, and evidences of ancient architectural skill are seen to-day on several of the islands, notably on Easter, Tonga, Pitcairn, and the Carolines.

3. The *Australic* stock consists of two widely separated groups, — the natives of Australia and Tasmania, and the Dravidians or 'hill peoples' of India. The inhabitants of Tasmania have disappeared entirely before the white race, and the native Australians of pure blood are fast following them in this respect. The Australian is of the lowest grade of culture ; a roving, ungoverned, naked savage, unacquainted with the bow and arrow, using as weapons the spear and a curious crooked club for throwing at objects, called the 'boomerang.' He is a cannibal of the most cruel kind, with a religion full of sorcery, witchcraft, and curious rites.

The Dravidians, though physically related to the Australians, are as widely different from them in other respects as they are widely separated geographically. The present 'hill tribes' of India are of Dravidian blood, their ancestors being the original inhabitants of the peninsula of Hindustan, occupying the soil at the time of the Aryan invasion, some four thousand years ago.

Means of Dispersal of the Island Peoples. — The question of how this great island region was peopled is exceedingly interesting. At a very early period, the inhabitants of Southern Asia, a people in all probability resembling the present Malays of the Malay Peninsula, spending much of their time at sea fishing and voyaging in their rude boats, gradually extended their voyages to distant islands. By this means all the islands came in time to be peopled, each group holding its own people, which sooner or later differed more or less from the other islanders, owing to various conditions of the different islands themselves, and the cutting off of frequent intercourse by the wide stretches of sea between them. To-day the Polynesians, and many of the other island peoples, are largely aquatic, being expert swimmers, spending a great deal of

their time in the water, and often making in their canoes voyages of many thousand miles. The Malay pirates have long been a terror to ships sailing in East Indian waters, and the *lascars*, or East Indian sailors, that help to make up the crews of ships in many parts of the world, belong to this Malay stock.

Peoples of the black race from the east shores of Africa have undoubtedly, at a remote period, reached some of the islands in the Indian Ocean, and, mixing with the tribes there, have produced the negro traits which we see in certain islanders to-day.

It was undoubtedly in some such way, by longer and wider voyages from the shores of the mainland and its adjacent islands, that man came in time to people the entire island region of the Pacific, and, coming under new and peculiar geographical conditions, to form a more or less distinct island race.

CHAPTER VI.

COMMERCE.



READING IN CONNECTION WITH THIS CHAPTER.

- * History of Civilization. — Buckle.
- Applied Geography. — Keltie.
- The Discovery of America. — Fiske.
- * The American Commonwealth. — Bryce.
- * The Influence of Sea Power upon History. — Mahan.



LESSON I. — THE BEGINNINGS OF COMMERCE.

What is Commerce ? — Commerce is the exchange of commodities between different peoples. *Trade* and *traffic* are terms meaning the same thing. The essential feature of commerce is the possession of certain things by a people in a land where these things are native or manufactured, and the need for these same things by peoples dwelling in lands where they do not naturally exist. These last peoples must, however, possess things needed by the others, in order to effect a trade.

It is plain to be seen, from what we have already learned, that geography is, after all, the essential element of commerce.

Money as a Medium of Exchange. — A unit of value or medium of exchange has existed from earliest times among the various tribes and peoples of the earth. Many of the commodities forming the wealth of peoples were difficult to transfer, and this led in the course of time to the use of money as representing a fixed standard of value.

Various articles have been used for money throughout history. The wealth of the early pastoral peoples was in their flocks and herds. The current value of anything was represented by the ox or sheep. Our word 'pecuniary,' in use to-day, comes from the Latin word *pecus*, meaning a flock. Among many savage tribes various articles are still in use as money. The Fiji Islanders use the tooth of the sperm whale; the natives of India use cowrie shells. Among some of the Indian tribes of North America, the skins of wild animals were for a long period a medium of exchange, and certain kinds of clay and ochre, used in the manufacture of pipe bowls and for decorating the body with paint, formed articles of standard value.

All this gives us a picture of how, in the early history of civilized peoples, money came to be established as a medium of exchange. As man's occupation passed from the life of a hunter to that of a shepherd, the skin of an animal gave place to the animal itself, and later to a standard of value representing the animal.

Gold and Silver. — A substance durable and lasting, easily transported, and capable of being divided became in time the needed requisite for a basis of money. From the rare kinds of stones, shells, and earths it passed to metals. Iron appears to have been used at a very early period for this purpose. Tin, copper, lead, and alloys of metals were in use at different periods of history by various peoples. Finally, gold and silver came into use, and gradually spread over the greater part of the earth. Smelting, or the process of separating the pure metal from its ore, and making it into a *piece*, was an art easily practiced by the more advanced peoples. The value of an ox or sheep was given by *weighing* the gold or silver. Every 'piece' must, therefore, have a given weight. For a long period the gold and silver were *weighed out* at the time of barter, but, as Aristotle, the old Greek philosopher, long ago writes, the piece was "afterwards determined in value by men putting a stamp upon it, in order that it may save them from the trouble of weighing it." In this way our present systems of coinage and exchange have arisen.

Ancient Routes of Commerce. — Water ways and river valleys formed natural highways of commercial intercourse at an early period. The ancient centers of civilization were in river valleys, and undoubtedly a traffic existed in the most ancient times along the lower Nile, and in the Euphrates and Tigris, to the Persian Gulf. These early traders without doubt coasted along the shores of Arabia and Africa in the Red Sea, and may have reached even the western shores of India at a very early date. These earliest centers of civilization, the Egyptian and Chaldean, in their fertile river valleys, were separated by the sandy wastes of the desert. Any communication between them must lie across this desert and be carried on by means of slowly moving caravans of camels. Famines occurred from time to time, and led to the storing up of large quantities of grain or 'corn' in the granaries of Egypt and the cities of Mesopotamia for time of need. In sacred writing the famine is mentioned that sent the sons of Jacob down into Egypt from Palestine for corn. The transaction with Joseph was made in silver coinage.

Arab Traders. — The Arabs, leading a wandering life along the edges of the deserts, early became the carriers for the more civilized nations about them. With their caravans of camels they carried merchandise across the wild and desert tracts of country between one city and another. The civilizations of the Nile and the Euphrates valleys were thus brought into contact, and the goods of each exchanged. In the Bible mention is made of one of these merchant caravans, the Ishmaelites, that carried Joseph into Egypt from the land of Canaan.

The Phœnicians. — When the Israelites crossed the Jordan into the land of Canaan after their forty years of wandering in the wilderness, they conquered and drove out the nations occupying the land. Among these were a people of the Semitic stock of the white race, known as the Phœnicians, who, after having been driven out, established themselves on the narrow strip of coast bordering on the Mediterranean Sea and shut off from the rest of Palestine by a series of low mountain ranges. With little chance for devel-

opment on land in so narrow a territory, these Phœnician people developed a seafaring life, and became the first sailors known to history. They built the famous cities of Tyre and Sidon, and their fleets of vessels became carriers for the civilized world at that time. Probably at first creeping along the shores in boats propelled by oars, they later hoisted sail and stood out into the Mediterranean. When King Solomon built the great temple at Jerusalem, he contracted with Hiram, king of Tyre, who fitted out a fleet of ships that sailed to a distant land called Ophir, and brought back costly woods, rich perfumes, oils, fruits, spices, precious metals, curious birds, ivory, and apes. This fleet was probably fitted out on the shores of the Red Sea, and, sailing through what are now the Straits of Bab-el-Mandeb, passed into the Indian Ocean. Whether they sailed to the west coast of India and some of its islands, or southward along the African coast, we are left to conjecture. The discovery of ancient ruins of undoubted Semitic origin, in connection with long-abandoned gold workings, in Mashonaland, south of the Zambesi, points to this region as the possible land of Ophir. To whatever place they sailed they must have kept close to shore, for they would hardly dare lose sight of land on so adventurous a voyage.

Sailing westwardly along the Mediterranean shores, these Phœnician navigators established a famous colony on the African coast, near the present Cape Bon, which later grew into the great city of Carthage.

Carthage. — The Phœnicians disappeared from history after the conquest of the East by Alexander. That great conqueror sighed, as his horses stood drinking on the banks of the Indus, to think "that there was no more world to conquer," little dreaming of the great Indian civilization, with all its magnificence and splendor, that lay almost within his reach. Other great seaports had arisen along the Mediterranean. Alexander founded on the western side of the Nile delta the city that to the present day bears his name. The Mediterranean became a highway of traffic. Athens, Corinth, and Argos rivaled one another in splendor and

commercial enterprise. Fleets of ships carried merchandise and treasures from one land to another. Foremost among these were the fleets of Carthage. The Carthagenians established the colonies of Carthagera and Barcelona on the shores of Spain, and had steered their ships through the 'straits,' between the Pillars of Hercules, out into the Atlantic. On the Atlantic coast of Spain they founded the seaport of Cadiz. One of their boldest navigators, Hanno, sailed southward along the western coast of Africa as far as the Bight of Biafra. Carthage fell under the Roman power one hundred and forty-six years before the birth of Christ, and the great city was razed to the ground. Corinth and Athens fell under the same power, and Rome held the commerce of the world.

Venice. — Among the numerous tribes inhabiting Italy in Roman times were a people called the Veniti, living in the valley of the Po. They were an agricultural people, but largely engaged also in various commercial enterprises. The Po flows into the Adriatic Sea, or that portion of the Mediterranean between the Italian and Balkan peninsulas. At its mouth it forms a delta consisting of numerous islands, between which the various channels of the river wind in their flow toward the sea. The barbarian hordes of the north, under Alaric, had spread terror over the plains of Italy, and when Attila with his savage bands of Huns swept westward, the Veniti fled with their goods to the islands of the delta, where they could effectually guard the various water ways surrounding their island home from barbarians unlearned in the handling of boats. Such was the beginning of the great city of Venice, which for more than a thousand years dazzled the world with her splendor and held the commerce of land and sea.

The Crusaders spread the glory of Venice far into the east, and brought back fabulous accounts of Oriental wealth and splendor. They thus did more to bring the east into commercial relations with the west than could possibly have been done by any other means at the time. Venetian travelers, like Marco Polo, made visits to the far east, reaching even China, or Cathay as it was then

called, and brought back glowing accounts of strange lands and peoples.

Venice, under the influence of her developing commerce, became the great center of finance, and the distributor of trade to all the nations of Western Europe. Bookkeeping and banking reached a high degree of perfection in Venice. Other cities of Italy followed in her steps and became rival commercial powers. Among these were Genoa, Florence, Naples, and even fallen Rome. Venice still held her own, however, and continued to command the commerce of the world.

LESSON II. — THE ERA OF DISCOVERY.

The Middle Ages. — The period of history usually called the Middle or Dark Ages covered about a thousand years, from the fall of Rome to the discovery of the New World. During all this time Venice from her early start and her peculiar geographical position, at the head of the Adriatic, held the key of commerce. The rest of civilized Europe, however, profited by this. Art and culture developed to a surprising degree under the influence of the wealth which Venice spread abroad. Notwithstanding the inroads of the Moors or Saracens from Northern Africa into Southern Europe, or the influence of the feudal system in the north, civilization, with all its attendant features, steadily advanced. Invention, manufacture, painting, letters, were all developed in the various cities of Southern Europe, and gradually spread into those of more northern parts. New ideas succeeded old ones, and among them new notions as to the shape of the earth and other geographical questions took a foremost place in men's minds. Some of the old Greek philosophers held the belief that the earth was round, but this idea died out with the fall of Greece under the Roman power, and throughout the long centuries that followed men clung to the ancient idea that the earth was a flat surface. The Mediterranean was the known sea. Beyond the 'straits' few had dared lose sight of land.

"Illusion dwells forever with the wave.
I know what spells are laid. Leave me to deal
With credulous and imaginative man;
For, though he scoop my water in his palm,
A few rods off he deems it gems and clouds.
Planting strange fruits and sunshine on the shore,
I make some coast alluring, some lone isle,
To distant men, who must go there or die."

Voyages of Discovery.—Such legends as those of the Golden Fleece and of the Land of the Hyperboreans, behind the north wind, had fired the imaginative mind of ancient Greece, and lured her sailors westward. By this means geographical knowledge was widened, and new settlements sprang up on distant shores of the Mediterranean. With the perfecting of the mariner's compass, about the beginning of the fourteenth century, a new era was at hand. Navigators dared venture out of sight of land with reasonable hopes of keeping to a given course and returning again to the port from which they had set sail. Italy was no longer alone the seafaring nation. Other nations of Europe joined in the new enterprise of voyaging and discovery. France, Spain, Holland, and England, under the advantages given to seagoing by the compass, had their ships upon the ocean, and before many years the Atlantic was being explored. In 1330 the Canary Islands were discovered, and a few years later the islands of Madeira. In 1431 the Azores, lying still farther west, were sighted.

Foremost among these voyagers were the Portuguese, who, seeing the advantages to be gained by a control of the commerce of the East Indies, bent their energies toward the discovery of a sea route in that direction. In 1486 Bartholomew Diaz, a Portuguese navigator, sailing southward along the African coast, reached the land's end. From the tempests and high-running waves which his vessel encountered, he called it the 'Cape of Storms,' but it gave such promise of a sea route to India that on his return King John II. of Portugal called it the Cape of Good Hope.

Christopher Columbus, a native of Genoa in Italy, conceived the idea that the earth was round, and that by sailing westward he

could reach India and China. His memorable voyage in 1492 from the port of Palos in Spain resulted in the discovery of the New World. His landfall was one of the Bahama Islands, but he believed that he had reached India. From this mistaken idea the entire island region is known to this day as the West Indies, and the inhabitants of America are called Indians. Though Columbus made four voyages to the New World, he never found out his mistake, and died in the belief that he had reached the East Indies.

In 1497 the Portuguese sailor, Vasco da Gama, doubled the Cape of Good Hope, reaching Zanzibar on the east coast of Africa, and later the port of Calcutta, thus opening the eastern sea route to India.

Ferdinand Magellan (or Magalhaens) of Spain, firmly impressed with the idea that the earth was round, sailed westward in 1519. He passed through the straits separating Tierra del Fuego from the main continent of South America, which bear his name to-day. He was killed in the Ladrone Islands, fighting with the natives, but his mate, Sebastian del Cano, took command of the vessel and still sailing westward reached Spain again at the end of three years, his being the first ship to sail around the earth.

Colonization and Development of Trade. — The Portuguese, from their peculiar position, occupying, like the ancient Phœnicians, a comparatively narrow territory on the shores of an almost unknown ocean, were the leaders in these voyages of discovery. They were the first to open trade with China, obtaining Macao as a settlement in 1537. Holland, like Portugal, was a maritime country. Her inhabitants naturally developed a seagoing life, and the Dutch soon followed in the wake of the Portuguese to the East Indies. They established a colony on the island of Java in 1575.

The East and the West were developing at the same time, under the hands of these seafaring nations of the Atlantic coast of Europe. Spain sent her fleets of armed ships into the Caribbean Sea, holding Central and South America in her power. To this day Spanish power and influence form the largest political

element in these countries. Under Cortez and Pizarro she claimed the great Aztec and Inca civilizations as her own.

France possessed herself of immense territories in North America following the valleys of two great rivers, the Mississippi and the St. Lawrence. She thus gained possession of water ways, the sources of which lay in the same region, but whose parted waters, flowing away at right angles to each other, brought them finally to the ocean, east and south, a full quarter of the compass apart.

The finding of gold in the New World was a powerful incentive to discovery and settlement, but a missionary spirit was also abroad. Foremost in the work of colonization were the Jesuits of France and Spain. War and Christianity forced themselves, hand in hand, into the wilderness and into the ancient culture of the New World, from Canada to Peru. Traces of this early colonization of America by the two great powers survive to-day in the French and Spanish names of many places.

Other nations made settlements along the Atlantic coast. The Dutch, at the mouth of the Hudson and in Surinam or Guiana in Northern South America. Great Britain had become, from her peculiar geographical position as an island, a nation of seamen. Under the Cabots she had explored the coast of Labrador, and in the age of Elizabeth she began her career as a naval power, which remains to-day one of the strongest features in her history. From her colonies sprang the greatest republic the world has ever known,—our own *United States of America*.

LESSON III. —PRESENT FEATURES OF COMMERCE AND CIVILIZATION.

Development of Resources in Different Countries. —The resources or wealth of a country are its natural products, — mineral, vegetable, and animal. From a very early period man has developed these native products in the various regions of the earth

which he inhabits, by mining, cultivation of the soil, and breeding of animals. Many of the useful plants and animals have been introduced by him into new countries when the climate and other conditions of life permitted. This we have already seen in the cultivation of some of the common food and clothing plants. The manufacture of the crude or raw materials into substances and articles of use form the various *industries* of a people. Products, either raw or manufactured, sent from countries where they are native, or can be made to the best advantage, to lands where they do not occur or cannot be worked up with profit, constitute the *exports* of a country, and those foreign articles received in return, constitute its *imports*. This interchange lies, as we have already seen, at the basis of commerce.

The *mineral resources* form an important feature in the wealth of many countries. *Iron* is the most useful and widespread of metals, occurring as an *ore* or earth which requires to be smelted in order to extract from it the pure metal for use. The smelting of iron forms a primitive industry of numerous savage tribes to-day, and it was in use among many of the inhabitants of Europe ages before the dawn of history. *Copper* occurs native or nearly pure in some regions, and in many others is found more or less abundantly in combination with other substances. The metal copper fused with *tin* forms the alloy known as *bronze*, a material in use by many primitive peoples, both in Europe and America, long before the use of iron. The Greeks and Romans drew their supply of copper mainly from the island of Cyprus in the Eastern Mediterranean, from which the name 'copper' and its scientific term *cuprum* are derived. *Lead* is also of quite ancient use, and occurs in various parts of the world, principally in combination with sulphur, as an ore called 'galena.' *Gold* and *silver* are the two most important precious metals, their workable ores forming a substantial basis of wealth in many countries. We have already learned that they have been known from a very ancient time. The thirst for gold was, as we have seen, an important element in the discovery of new countries, especially in the Western Hemi-

sphere. *Salt* is a widespread mineral substance, used by mankind as a necessary element of food. It exists either in rock masses, which must be mined out, or as a crust-like surface deposit in places that were once covered by the sea. The use of salt goes back to a great antiquity. It was carried long distances, and the earliest commercial routes are supposed to have been 'salt roads.' One of these routes extended from the salt deposits of the Sahara into Egypt.

Vegetable products, being mainly dependent upon climate, are widely different in different parts of the earth. The forests of the temperate zone yield various woods useful for building and other purposes. Lumbering is, therefore, an important industry in these regions. Mahogany and ebony grow in the tropical forests of both hemispheres. The tropical forests likewise yield a vast number of peculiar oils, gums, resins, india rubber, and coloring materials, useful in the arts of civilized peoples. The distribution of the more important food plants we have already considered. Plants yielding substances from which various drugs are extracted abound in tropical forests. All these products, found native or wild in the different countries, are developed by man as commercial enterprises.

Coal is the result of the plant life of past ages and occurs in beds of great extent and thickness in various parts of the earth. It forms the main fuel substance of most civilized countries, and its mining is among the most important industries.

Animal products, such as wool, feathers, silk, hides, tallow, etc., are developed in almost every land. Open and extensive pasture lands and grassy mountainous regions, especially in temperate regions, form the natural home of the grazing animals, as cattle, sheep, and horses, the kinds most useful to man. The skins and furs of wild animals are an important resource in the development of a new country. In the early history of North America the Hudson Bay Company, an English enterprise, planted outposts and trading houses in the northern wilderness for this purpose, and they formed an important element in discovery and settle-

ment. The manufacture of silk from the silk-worm is a peculiar Chinese industry which has spread to other countries, where the climate and the growth of the mulberry tree, on the leaves of which this worm feeds, permit its introduction. The fossil remains of animals form in some places immense deposits of bone earth, which is useful as a fertilizer to enrich the soils of crop-growing lands. The same is true of the vast quantities of *guano*, or the accumulations of sea-bird droppings on various oceanic islands. The sea has also yielded up its harvests to man. Fishing forms the main industry of many coastwise peoples in northern regions, and the pursuit and capture of whales in the oceans of both the Northern and the Southern hemispheres, for the valuable whalebone and sperm oil, are peculiar to certain seaports on both sides of the North Atlantic and also on the Pacific coast of North America.

Location of Commercial Centers. — The cities of the world have developed mainly as the result of two causes: 1, protection of groups of peoples, and 2, as centers of commercial activity. The former became seats of government, centers of power, as well as centers of commerce, and were located in positions that commanded a more or less extensive surrounding territory. The latter were located with a special view to the shipping facilities, — good harbors, easy access to the sea. Nearly all the great cities of the world are located on some river, usually not far from its mouth, commanding, on the one hand, the interior of a country with its native products, and, on the other, the commercial highway of the ocean. In the settlement of every country, this has always been the leading feature. The river, bay, or estuary was an inviting harbor, and settlements grew up along its banks. As an illustration of this, we have only to recall the early colonies of our own country, — Jamestown, the Delaware settlements, the Dutch at the mouth of the Hudson, etc. Ancient history is full of similar illustrations. The Byzantine Empire, with its center Byzantium, was founded by Greek traders six hundred years B.C., on a bay of the western shore of the Bosphorus, the strait leading

from the Mediterranean through the Sea of Marmora into the Euxine or Black Sea. Here was a vantage point both in commerce and warfare, that has remained a power to the present time. More than three hundred and twenty years after Christ the city of Constantinople arose on the ruins of Byzantium. The city forms the center of Turkish rule to-day, surrounded as it is by the nations of the white race.

Commercial Relations between Different Countries. — The present commercial relations of the various countries of the earth are the result of the past conditions. Geography still plays the most important part, but the advance of civilization has overcome many obstacles which at an earlier day were hindrances and barriers to the full development of commerce. For long years the vast expanse of the ocean; the dreary wastes of the desert; the awful solitudes of the mountain ranges, rising into regions of perpetual snow; the savage men and savage beasts of almost unknown lands; the impenetrable forests, marshes, and deadly climate of the tropics, — all tended to separate more or less widely the various countries of the earth from one another. With the advance of civilization, two important discoveries have taken place, which have largely altered the face of the earth in relation to commerce. These two discoveries are *steam* and *electricity*, and their application through various machines to the multitude of human needs. Railroads and ocean cables girdle the earth as a network, bringing distant lands into almost daily contact and communication. New York, San Francisco, London, Melbourne, Buenos Ayres, Calcutta, Zanzibar, and all the great cities of the world flash messages to one another around the earth. The locomotive has become the great agent of civilization. Its whistle and roar wake echoes in places that a few years ago resounded only to the cries of savages and wild beasts. The Atlantic and Pacific shores of North America lie within a five days' journey of each other. The great Siberian railway will soon reach across Eurasia from the Baltic Sea to the Pacific Ocean. The heart of 'Darkest Africa' is being penetrated by a railroad

laid along the banks of the Kongo. In the sacred land of Palestine, a railway has been built from Jaffa to Jerusalem, and this great civilizer stands to-day before the Holy City, the greatest conqueror that has ever compassed her time-worn walls.

The ocean has become the highway of commerce ; its once trackless waste is traversed by paths leading to and from every seaport of the world. Fast-going steamships are afloat, carrying the merchandise of nations. In every port the ships of all nations lie, loading and unloading their various cargoes.

“Yon deep bark goes
Where Traffic blows,
From lands of sun to lands of snows ; —
This happier one,
Its course is run
From lands of snow to lands of sun.”

Navigation has become a science. The invention of instruments to determine the position of any point on the earth's surface was second only to the discovery of the compass in its importance to the world. The imaginary lines surrounding the earth are real lines on a map or chart, and are of the utmost value to navigators, travelers, and students of geography. They tell exactly the location of every spot on the earth, whether land or sea, enabling the mariner, tossing on a trackless waste of waters thousands of miles from any shore, to know exactly where he is. A transatlantic steamer falls in with a wreck floating in mid-ocean. Mid-ocean is a very big place, but if the steamer's log reports from the captain's observations at the time, — Latitude $45^{\circ} 26' N.$; Longitude $32^{\circ} 18' 23'' W.$, — by referring to the chart or map every one knows the exact spot where the derelict was seen. Latitude and longitude are reckoned by observations on the position of certain of the heavenly bodies, — sun, moon, and various stars, in relation to one another and to the earth, and on the particular time of day. This is done through the use of an instrument called the *sextant*. Time or longitude is calculated from the meridian of Greenwich. The earth's rotating on its axis from west to east brings the sun

over the meridian of every place on its surface once in twenty-four hours. It is then twelve o'clock, midday, at that particular place. In twelve hours the sun will be on the same meridian, only exactly on the opposite side of the earth, and it will be twelve o'clock, midnight, at the place in question.

Steam runs the plow and reaps the harvest in many lands. The wheat that to-day is growing on a Dakota prairie is cast in a few weeks into the bins of a Liverpool warehouse. The long-horned steer grazing over the range of a Texas ranch, in a single week finds himself on the crowded cattle deck of an Atlantic Liner rolling in mid-ocean on his way to the English market. This bringing of the ends of the earth together has introduced many complex problems into civilization and commerce. The influence of a labor cheaper in one country than in another sends the raw materials of the latter to be manufactured by the former, and sent back again at a much less cost than it would take to make the articles in the country where the material was produced. The United States ships raw cotton to England, for example, to be made into garments which are sent back and sold cheaper than they could be if made at home. The importance of commercial intercourse between countries is a powerful influence in promoting peaceful relations. The growing tendency is not war, but arbitration and peace principles.

One more fact of importance. The races of mankind have come into closer contact through the wide spreading of commercial intercourse. The benefits to the less-advanced peoples will be great, if they are morally and physically able to fall in with the march of civilization. But the rights of each and every man as a member of the great human family, no matter to what race he may belong, must be respected, and it becomes the duty of the more highly enlightened peoples, the men and women of the white race in all parts of the world, to help their less-favored brethren and sisters to a knowledge of the best way to live. "Man," the poet has said, "must rule the empire of himself." In the long years of his struggle with nature he has overcome many obstacles,

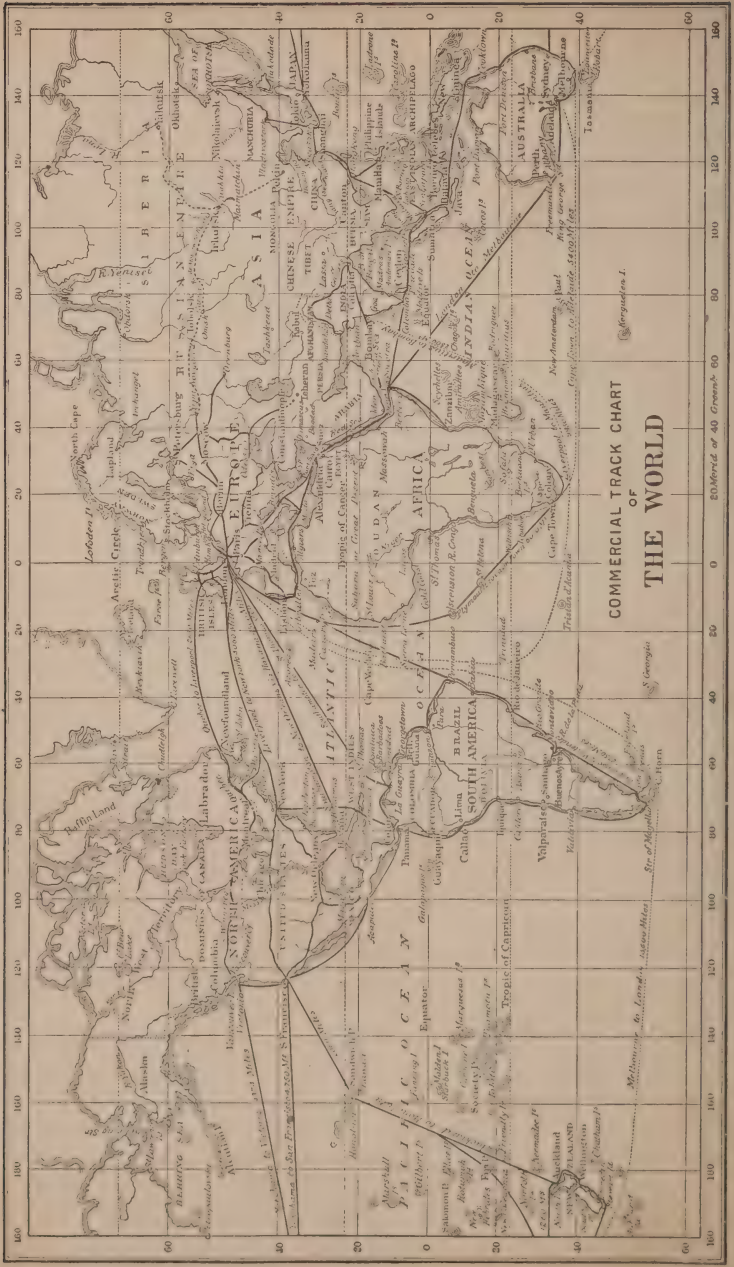
and now beholds himself master of the world. There will always be some high ideal to be attained, some 'best thing' in life to be reached, and these can only be reached by man's mastery of himself.

The study of geography has, after all, revealed man in his true light, — that of a being overcoming his surroundings, and attaining high places through perpetual struggle.

APPENDIX.



- I. THE PRINCIPAL STATES AND CITIES OF THE WORLD.
- II. POPULATION OF THE EARTH.
- III. FORMS OF GOVERNMENT.
- IV. EXTRACT FROM FIRST REPORT OF UNITED STATES BOARD ON
GEOGRAPHIC NAMES.
- V. GEOGRAPHICAL DISTRIBUTION OF ANIMALS. — A SYNOPSIS OF
STUDY.
- VI. HOW TO READ A WEATHER MAP.



COMMERCIAL TRACK CHART
OF
THE WORLD

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APPENDIX.

I. THE PRINCIPAL STATES AND CITIES OF THE WORLD.

ADAPTED FROM BARTHOLOMEW'S GEOGRAPHICAL STATISTICS.

Arranged alphabetically.

THE pupil should locate each country on the map, the situation of its principal towns, and its foreign possessions. The teacher should question, with the use of a good wall atlas, as to these points, endeavoring also to bring out the fact of geographical position in relation to commercial advantages.

Argentine Republic. — SOUTH AMERICA.

Principal Towns. — Buenos Ayres, Cordova, Rosario, La Plata, Mendoza, Panama, Tucuman, etc.

Exports. — Wool, hides, sheepskins, tallow, live animals, maize, wheat, flax, salted meat.

Mineral Products. — Copper, silver, coal, salt, alum, sulphur, and gold.

Austria-Hungary. — EUROPE.

Principal Towns. — Vienna, Budapest, Prague, Trieste, Lamberg, etc.

Exports. — Agricultural produce, timber, sugar, fancy wares, live animals, wool, glass, leather, silks, cottons, wine, etc.

Belgium. — EUROPE.

Principal Towns. — Brussels, Antwerp, Ghent, Liege, etc.

Exports. — Cotton, woolen and linen thread, cereals and rice, ma-

chinery, coal and coke, stones, wool, wrought iron, glass, sugar, hides, zinc, oil seeds, resin, candles, vegetables, etc.

Bolivia. — SOUTH AMERICA.

Principal Towns. — Sucre, Potosi, La Paz, Cochabamba, etc.

Brazil. — SOUTH AMERICA.

Principal Towns. — Rio de Janeiro, Bahia (San Salvador), Recife (Pernambuco), etc.

Exports. — Raw cotton, sugar, india rubber, coffee, cocoa, tobacco, gum, hides, etc. Logwood, mahogany, rosewood, and brazilwood grown in the forests.

British Empire. — BRITISH ISLES.

Great Britain (England, Wales, Scotland, and outlying islands) and Ireland.

Principal Towns. — London, Liverpool, Glasgow, Manchester, Birmingham, Dublin, Leeds, Sheffield, Edinburgh, Leith, Belfast, Bristol, Newcastle-on-Tyne, etc.

THE BRITISH EMPIRE.

Countries under British Rule in Europe. — Great Britain and Ireland, Heligoland, Gibraltar, Malta.

In Asia. — Cyprus, British India, Ceylon, Andaman and Nicobar islands, Straits Settlements and Malay Protectorate, Upper Burma, North Borneo, Hong-Kong, Labuan Island, Aden, Perim, and Mosha, Kamaran Island, Keeling and Christmas Islands, Socotra Island.

In Oceania. — New South Wales, Norfolk Island, Victoria, Queensland, South Australia, Western Australia, Tasmania, New Zealand and Dependencies, Fiji Islands, Rotumah Island, Lord Howe Island, Hervey or Cook Islands, New Guinea, and other islands.

In Africa. — Cape Colony and Dependencies, Natal, Zululand, Bechuanaland, Matabeleland to the Zambesi, Walfisch Bay, Sierra Leone and Gambia River, Gold Coast and Lagos, Niger Districts, St. Helena and Ascension, Imperial British-East Africa, Somali Coast, Tristan d'Acunha, Mauritius and Dependencies, New Amsterdam, and St. Paul.

In North America. — Dominion of Canada, Newfoundland, Bermudas, Bahamas, Jamaica, Turk and Caicos Islands, Cayman Islands, British Honduras, Barbadoes and Leeward and Windward Islands of the West Indies.

In South America. — Trinidad, British Guiana, Falkland Islands, South Georgia.

Principal Towns of British India. — Calcutta, Bombay, Madras, Hyderabad, Cawnpore, Lahore, Lucknow, Benares, Delhi, Agra, Rangoon, etc.

Of Australasia. — Melbourne (Victoria), Sydney (New South Wales), Adelaide (South Australia), Brisbane (Queensland), Hobart Town (Tasmania), Perth (West Australia), Auckland (New Zealand), etc.

Of British America. — Montreal, Toronto, Quebec, Halifax, Ottawa, St. John, Winnipeg, Victoria, etc.

Bulgaria. — EUROPE.

Principal Towns. — Sofia, Varna, Shumla, Rustchuk, Sistova, Plevna, etc.

Exports. — Corn, wool, tallow, hides, butter, cheese, flax, and timber.

Central America.

Republics and Capitals. — Guatemala (Capital City — Guatemala), Salvador (San Salvador), Nicaragua (Managua), Honduras (Tegucigalpa), Costa-Rica (San José).

Chile. — SOUTH AMERICA.

Principal Towns. — Punta Arenas (Straits of Magellan), Concepcion, Talca, Santiago, Valparaiso, etc.

Exports. — Nitre, copper bars and ores, silver ores, corn, flour, leather, and guano.

China. — ASIA.

Principal Towns. — Peking, Nanking, Shanghai, Foochow, Ningpo, Amoy, Canton, etc.

Exports. — Tea, silk, silk manufactures, and sugar.

Dependencies. — Manchuria, Mongolia, Thibet, Jungaria, Eastern Turkestan.

Colombia. — SOUTH AMERICA.

Principal Towns. — Panama, Cartagena, Socorro, Medellin, Bogota.

Congo Free State. — AFRICA.

Principal Stations. — Banana, Borna, Matadi, Lukunga, Leopoldville, Bangala, and Stanley Falls.

Denmark. — EUROPE.

Denmark Proper. — Copenhagen, Islands in the Baltic, Jutland, Faroe Islands.

Dependencies. — Iceland, Greenland, West Indies (St. Croix, St. Thomas, and St. John).

Exports of Denmark Proper. — Wheat, barley, bacon, hams, flour, butter, eggs, hides, skins, corn meal and oil cakes, horses and cattle.

Ecuador. — SOUTH AMERICA.

Principal Towns. — Quito, Guayaquil, Cuenca, Riobamba.

France. — EUROPE.

Principal Towns. — Paris, Lyons, Marseilles, Bordeaux, Nantes, Rouen, Havre, Nice, Brest, Toulon, Orleans, Calais, Boulogne, Versailles, etc.

Colonies and Dependencies in Asia. — Indian Possessions, Cochinchina, French Tonquin. Cambodia and Annam under French protection.

In Africa. — Algeria, Senegambia, Gaboon and Gold Coast, Congo Region, Reunion, etc.

In America. — Guiana or Cayenne, Guadeloupe, Martinique, St. Pierre, etc.

In Oceania. — New Caledonia, Marquesas Islands, Tahiti, Gambier, and other islands.

Tunis, in North Africa, is a French Protectorate.

Products and Exports. — Silks, dress stuffs, leather goods, jewelry, wines and spirits, cereals, perfumes, chemicals, etc.

German Empire.

Principal Towns. — Berlin, Hamburg, Munich, Dresden, Leipzig, Cologne, Frankfort-on-Main, Bremen, Strasburg, Potsdam, etc.

Protectorates in Africa. — On the slave coast, on the Cameroon River, coast of Damaraland and Namaqualand, territories of several negro chiefs in East Africa, portion of Zanzibar coast.

In Oceania. — A portion of New Guinea, the Bismarck Archipelago, and other islands.

Products and Exports. — Agricultural produce, woolen and silk manufactures, sugar, leather wares, cotton stuffs, coal, machinery, chemicals, wines, etc.

Greece. — EUROPE.

Principal Towns. — Athens, Piræus, Patras, Hermopolis, Corfu, Zante, Larissa, Argos, Pyrgos.

Products. — Raisins, olive oil, lead, hides, wine, figs, gallnuts, etc.

Haiti. — WEST INDIES.

Chief Town. — Port au Prince.

Exports. — Mahogany, logwood, coffee, cocoa, sugar, honey, and gum.

Haiti and St. Domingo are on the same island.

Hawaii or Sandwich Islands. — PACIFIC OCEAN.

Chief Town. — Honolulu.

Exports. — Sugar, rice, bananas, hides, wool, and coffee.

Italy. — EUROPE.

Principal Towns. — Naples, Milan, Rome, Turin, Palermo, Genoa, Florence, Venice, Bologna, Leghorn, Messina, Verona, etc.

Exports. — Olive oil, hemp, oranges and lemons, sulphur, chemical products, shumac, wine, almonds, and stones.

Colonial Possessions. — A strip on the Red Sea from Assab Bay to Massowah.

Japan. — ASIA.

Principal Towns. — Tokio, Yokohama, Osaka, etc.

Exports. — Silk, tea, tobacco, coffee, rice, copper, camphor, wax, fish, etc.

Korea. — ASIA.

Chief Town. — Seoul.

Liberia. — WEST AFRICA.

Chief Town. — Monrovia.

Exports. — Coffee, cocoa, sugar, wax, ginger, palm oil, indigo, hides, ivory, gold dust, etc.

Madagascar.

Island in Indian Ocean east of Africa.

France regulates the foreign relations of the country.

Exports. — Cattle, india rubber, hides, horns, coffee, lard, sugar, vanilla, wax, gum, rice, and seeds.

Mexico. — AMERICA.

Principal Towns. — City of Mexico, Monterey, Vera Cruz, Puebla, Campeche, Colima, Oaxaca, Zacatecas, San Luis Potosi, etc.

Exports. — Minerals, mahogany, dye woods, cattle, vanilla, coffee, cocoa, cochineal, tobacco, drugs, etc.

Montenegro. — EUROPE.

Chief Towns. — Cittigné, etc.

Exports. — Shumac, flea-powder, smoked sardines, smoked mutton, hides, skins, and furs.

Morocco. — NORTH AFRICA.

Chief Towns. — Fez, Morocco, etc.

Ports. — Tangier, Tetuan, Rabat, El Araish, Casa Blanca, etc.

Exports. — Maize, beans, peas, oil, wool, dates, fowls, eggs, carpets, slippers, goatskins, leather, grain, cattle, ostrich feathers, etc.

Netherlands (Holland). — EUROPE.

Chief Towns. — Amsterdam, Rotterdam, The Hague, etc.

Colonies. — Java (Batavia the capital), east and west coast of Sumatra, coast possessions in Borneo, Celebes, Moluccas, New Guinea, and other East Indian Islands. Several West Indian Islands — Curacao Aruba, St. Martin, etc. Surinam or Dutch Guiana in South America.

Exports. — Butter, butterine, oxen and sheep, cheese, gin, sugar, iron and steel goods, woolen and cotton manufactures, silk stuffs, and ribbons.

Orange Free State. — SOUTH AFRICA.

Mainly a grazing country, being too dry for agriculture.

Chief Town. — Bloemfontein.

Exports. — Wool, ostrich feathers, hides, diamonds, etc.

Paraguay. — SOUTH AMERICA.

Principal Towns. — Asuncion, Villa Rica, etc.

Products. — Sugar, rum, cotton, woolen cloths, and leather.

Persia. — ASIA.

Principal Towns. — Tabriz, Teherân, Ispahân, Astrabad, etc.

Exports. — Silks, carpets, hides, tobacco, opium, gum, wool, dates, cereals, rice, etc.

Peru. — SOUTH AMERICA.

Principal Towns. — Lima, Callao, Arequipa, Cuzco, Chiclayo.

Exports. — Guano, nitrate of soda, sheep and alpaça wool, sugar, silver, and chinchona.

Portugal. — EUROPE.

Portugal and the Azores and Madeira Islands.

Principal Towns. — Lisbon, Oporto, Funchal (Madeira).

Colonial Possessions.

In Africa. — Cape Verde Islands, Guinea, Prince's and St. Thomas's Islands, Ajuda, Angola, Benguela, Mozambique, Congo Districts, etc.

In Asia. — Goa, Daman, Diu, etc. (India). Timor (Indian Archipelago). Macao (China).

Exports. — Wine, cork, cattle, copper ore, fruits, oil, and salt.

Roumania. — EUROPE.

Principal Towns. — Bukarest, etc.

Exports. — Wheat, barley, maize, rocksalt, and cattle.

Russia. — EUROPE.

Russia Proper, Poland, Finland, Caucasus, Trans-Caspian, Central Asia, and Siberia.

Principal Towns. — St. Petersburg, Moscow, Warsaw, Riga, Khar-koff, Odessa, Astrakhan, etc.

Exports. — Grain, wool, hemp, rape and linseed, cordage and twine, tallow and stearine, bristles, oil-seed cake, tar, etc.

San Domingo. — WEST INDIES.

Chief Town. — San Domingo.

Exports. — Lignum vitæ, logwood, mahogany, coffee, fustic, tobacco, and cocoa.

Servia. — EUROPE.

Principal Towns. — Belgrade, etc.

Exports. — Live animals, grain, cereals, hides, prunes, etc.

Siam. — ASIA.

Principal Town. — Bangkok.

Exports. — Rice, gums, teak, sandalwood, rosewood, aloeswood, pepper, sesame, skins, birds' nests, etc.

South African Republic.

(TRANSVAAL.)

Chief Town. — Pretoria.

Exports. — Wool, cattle, hides, grain, ostrich feathers, ivory, butter, gold, etc.

Spain. — EUROPE.

Spain Proper, the Canary and Balearic Islands.

Principal Towns. — Madrid, Barcelona, Valencia, Seville, Malaga, Cartagena, Cadiz, Palma (Canaries), etc.

Exports. — Wine, oranges, raisins, grapes, olive oil, cattle, esparto grass, cork, copper ores, iron ores, lead, salt, quicksilver, etc.

Sweden and Norway. — EUROPE.**Sweden.**

Principal Towns. — Stockholm, Upsala, Kalmar, etc.

Exports. — Wood and timber, oats, iron bars, butter, live animals, etc.

Norway.

Principal Towns. — Christiania, Bergen, Stavanger, etc.

Exports. — Timber, cod, cod oil, herrings, minerals, ice, etc.

Switzerland. — EUROPE.

Principal Towns. — Geneva, Basel, Bern, Lausanne, Zürich, Luzern, etc.

Manufactures and Exports. — Silks, cottons, linen, woolens, lace, thread, watches, machinery, ice, cattle, cheese, etc.

Turkish Empire.

Turkey in Europe, beside the immediate provinces, includes East Roumelia as a self-governing province, and Bulgaria as a tributary principality, also Bosnia, etc.

Tripoli, in North Africa, is a Turkish province.

Principal Towns. — *In Europe.* — Constantinople, Salonica, Adrianople, Philippopolis, etc.

In Asia. — Smyrna, Damas, Bagdad, Aleppo, Beirút, Mosul, Jerusalem, Trebizond, etc.

Exports. — Tobacco, cereals, fruits, silk, opium, mohair, cotton, coffee, skins, wool, oil seeds, valonia, carpets, etc.

Egypt. — AFRICA.

(*Turkish Protectorate.*)

Principal Towns. — Cairo, Alexandria, Damietta, Rosetta, Port Said, Suez, etc.

Exports. — Cotton and cotton seed, beans, wheat, sugar, maize, rice, gum, hides, wool, ivory, ostrich feathers, etc.

United States of America.

| STATES. | CAPITALS* AND CHIEF TOWNS. |
|--------------------------------|---|
| Alabama | Montgomery,* etc. |
| Arkansas | Little Rock,* etc. |
| California | Sacramento,* San Francisco, etc. |
| Colorado | Denver,* Colorado Springs, etc. |
| Connecticut | Hartford,* New Haven, etc. |
| Delaware | Dover,* Wilmington, etc. |
| District of Columbia | Washington* (Capital of U.S.). |
| Florida | Tallahassee,* Jacksonville, etc. |
| Georgia | Atlanta,* Savannah, etc. |
| Idaho | Boise City,* etc. |
| Illinois | Springfield,* Chicago, etc. |
| Indiana | Indianapolis,* etc. |
| Iowa | Des Moines,* etc. |
| Kansas | Topeka,* etc. |
| Kentucky | Frankfort,* Louisville, etc. |
| Louisiana | Baton Rouge,* New Orleans, etc. |
| Maine | Augusta,* Bangor, Portland, etc. |
| Maryland | Annapolis,* Baltimore, etc. |
| Massachusetts | Boston,* Worcester, etc. |
| Michigan | Lansing,* Detroit, etc. |
| Minnesota | St. Paul,* Minneapolis, etc. |
| Mississippi | Jackson,* Vicksburg, etc. |
| Missouri | Jefferson City,* Kansas City, St. Louis, etc. |
| Montana | Helena,* etc. |
| Nebraska | Lincoln,* Omaha, etc. |
| Nevada | Carson City,* etc. |
| New Hampshire | Concord,* Portsmouth, etc. |
| New Jersey | Trenton,* Newark, etc. |
| New York | Albany,* New York, Troy, Buffalo, Rochester, Syracuse, etc. |
| North Carolina | Raleigh,* etc. |
| North Dakota | Bismarck,* etc. |
| Ohio | Columbus,* Cincinnati, Cleveland, Toledo, etc. |
| Oregon | Salem,* Portland, etc. |
| Pennsylvania | Harrisburg,* Pittsburg, Philadelphia, etc. |
| Rhode Island | Providence,* Newport, etc. |

STATES.

CAPITALS* AND CHIEF TOWNS.

| | |
|------------------------|-----------------------------|
| South Carolina | Columbia,* Charleston, etc. |
| South Dakota | Pierre,* etc. |
| Tennessee | Nashville,* etc. |
| Texas | Austin,* Galveston, etc. |
| Utah | Salt Lake City.* |
| Vermont | Montpelier,* etc. |
| Virginia | Richmond,* etc. |
| Washington | Olympia,* Tacoma, etc. |
| West Virginia | Wheeling.* |
| Wisconsin | Madison,* Milwaukee, etc. |
| Wyoming | Cheyenne,* etc. |

TERRITORIES.

| | |
|------------------------|--------------------------------------|
| Alaska | Sitka.* |
| Arizona | Phoenix,* Tucson, etc. |
| Indian Territory . . . | No organized Territorial Government. |
| New Mexico | Santa Fe,* etc. |
| Oklahoma | Guthrie.* |

Uruguay. — SOUTH AMERICA.

Principal Towns. — Montevideo, etc.

Exports. — Cattle, preserved meats, skins, hides, tallow, wool, hair, guano, bone dust, ostrich feathers, etc.

Venezuela. — SOUTH AMERICA.

Principal Towns. — Caracas, Tocuyo, Maracaybo, La Guayra, etc.

Exports. — Coffee, sugar, corn, cocoa, cotton, hides, tobacco, indigo, bark, tallow, dyewoods, timber, copper ores, and gold.

Zanzibar. — EAST AFRICA.

Chief Towns. — Zanzibar (on an island off the coast), Mombas, Quiloa, etc.

Exports. — Ivory, caoutchouc, hides and skins, cloves, orchilla, cocoanuts, gum-copal, seeds, etc.

II.—POPULATION OF THE EARTH BY CONTINENTS.

From Proceedings of the Royal Geographical Society for January, 1891.

| Divisions. | Area in Square Miles. | Inhabitants. | Number of Inhabitants per Square Mile. |
|-------------------------|--------------------------|---------------|--|
| Africa | 11,514,000 | 127,000,000 | 11.0 |
| America, N. | 6,446,000 | 89,250,000 | 13.8 |
| America, S. | 6,837,000 | 36,420,000 | 5.3 |
| Asia | 14,710,000 | 850,000,000 | 57.7 |
| Australasia | 3,288,000 | 4,730,000 | 1.4 |
| Europe | 3,555,000 | 380,200,000 | 106.9 |
| Polar Regions | 4,888,800 | 300,000 | 0.7 |
| Total | 51,238,800 | 1,487,900,000 | 29.0 |

POPULATION OF THE EARTH ACCORDING TO RACE.

ESTIMATE BY JOHN BARTHOLOMEW, F.R.G.S.

| Race. | Number. | Race. | Number. |
|-----------------|-------------|-----------------|---------------|
| White | 610,500,000 | American . . . | 15,000,000 |
| Black | 150,150,000 | Islanders . . . | 35,000,000 |
| Asian | 630,000,000 | Total . . . | 1,440,650,000 |

III.—FORMS OF GOVERNMENT.

Absolute Monarchies. — China, Madagascar, Morocco, Persia, Russia, Siam, Turkey.

Limited Monarchies. — Austria-Hungary, Belgium, British Empire, Denmark, Germany, Greece, Hawaii, Italy, Japan, Netherlands, Portugal, Roumania, Servia, Spain, Sweden, and Norway.

Republics. — Argentine Republic, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, France, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Orange Free State, Paraguay, Peru, Salvador, San Domingo, Switzerland, Transvaal, United States of America, Uruguay, Venezuela.

IV.—EXTRACT FROM THE FIRST REPORT OF THE UNITED STATES BOARD ON GEOGRAPHIC NAMES.

| Letters. | Sounds. | Example. |
|----------|--|---|
| a | <i>ah</i> , <i>a</i> as in <i>father</i> | Java, Banána, Somáli, Bari. |
| e | <i>eh</i> , <i>e</i> as in <i>men</i> | Tel el Kebír, Oléleh, Medina, Levuka, Peru. |
| i | English <i>e</i> ; <i>i</i> as in <i>ravine</i> ; the sound of <i>ee</i> in <i>beet</i> . Thus, not Feejee, but | Fiji, Hindi. |
| o | <i>o</i> as in <i>mote</i> . | |
| u | double <i>o</i> , as in <i>boot</i> . All vowels are shortened in sound by doubling the following consonant Doubling of a vowel is only necessary where there is a distinct repetition of the single sound | Yarra, Tanna, Jidda, Bonni. Nuulua. |
| ai | English <i>i</i> as in <i>ice</i> | Shanghai. |
| au | <i>ow</i> as in <i>how</i> . Thus, not Foochow, but | Fuchau. |
| ao | is slightly different from above | Nanao. |
| ei | is the sound of the two Italian vowels, but is frequently slurred over, when it is scarcely to be distinguished from <i>ey</i> in the English <i>they</i> | Beirút, Beilúl. |
| b | English <i>b</i> . | |
| c | is always soft and nearly the sound of <i>s</i> ; the hard <i>c</i> is given by <i>k</i> | Celebes. |
| ch | is always soft, as in <i>church</i> | Chingchin. |

| Letters. | Sounds. | Example. |
|----------|--|--|
| d | English <i>d</i> | |
| f | English <i>f</i> ; <i>ph</i> should not be used for the sound of <i>f</i> . Thus, not Haiphong, but . . . | Haifong, Nafa. |
| g | is always hard (soft <i>g</i> is given by <i>j</i>) . . . | Galápagos. |
| h | is always pronounced when inserted. | |
| j | English <i>j</i> . <i>Dj</i> should never be put for this sound | Japan, Jinchuen. |
| k | English <i>k</i> . It should always be put for the hard <i>c</i> . Thus, not Corea, but | Korea. . |
| kh | the Oriental guttural | Khan. |
| gh | is another guttural, as in the Turkish . . | Dagh, Ghazi. |
| l | as in English. | |
| m | | |
| n | | |
| ng | has two slightly different sounds, as in <i>finger</i> , <i>singer</i> . | |
| p | as in English. | |
| q | should never be employed; <i>qu</i> is given by <i>kw</i> | Kwangtung. |
| r | as in English | |
| s | | |
| t | | |
| v | | Sawákin. |
| w | | |
| x | is always a consonant, as in <i>yard</i> (Kikuyu), and therefore should not be used for the vowel <i>i</i> . Thus, not Mikindány, but . . | |
| y | | Mikindáni. |
| z | English <i>z</i> | Zulu. |
| | Accents should not generally be used, but where there is a very decided, emphatic syllable, or stress which affects the sound of the word it should be marked by an acute accent | Tongatábu, Galápagos, Paláwan, Saráwak. |

V.—GEOGRAPHICAL DISTRIBUTION OF ANIMALS.

A SYNOPSIS OF STUDY.*

Reading Matter.—Works by Alfred Russell Wallace—"Darwinism," "Island Life," and "Geographical Distribution of Animals." Also "The Geographical and Geological Distribution of Animals"—by Angelo Heilprin. International Science Series. Also articles by Dr. C. Hart Merriam in Bulletins of the U.S. Department of Agriculture.

1. Geographical Distribution and Diversity of Species.—General facts and observations.

a. Popular idea—diversity of animals due to diversity of climate and vegetation, animals distributed in zones or regions of latitude—*e.g.* arctic, temperate, and tropical zones.

b. Incorrectness of this idea seen by comparing the animals of equatorial Africa and South America, South Africa and Australia, Europe and temperate America.

c. Incorrectness of idea proved also by widely ranging animals—as opossums; crows found in all parts of the world but South America; sloths found only in that continent; antelopes found only in Asia and Africa; lemurs only in Madagascar and adjacent regions; birds of paradise only in New Guinea.

2. The Causes of Dispersal.

a. Original home of an animal or its 'center of development.'

b. Increase of individuals is enormous and causes rapid diminution of food-supply in a restricted area—(*e.g.* a bird living 5 years and producing 10 pairs of young would increase, if unchecked, to 100,000,000 in 40 years—*Wallace*).

c. This necessitates the enlarging of an animal's range in order to obtain more food, and establishes a *wandering habit*.

d. Accidental causes of dispersal—driftwood, floating ice, winds, etc.

3. Barriers Limiting an Animal's Range.—An animal in wandering meets with various barriers that tend to check its further progress—physiographic barriers.

Most important barrier is *temperature* (isotherms). Next in importance is—

a. The ocean and arms of the sea.

b. Islands, surrounded by an ocean barrier.

* This synopsis is intended especially for the teacher.

c. High mountain ranges become barriers by reason of their low temperature (snow line).

d. Deserts and Forests.

We have to consider what facilities different classes have in overcoming barriers, and what barriers are most effectual.

4. **Mammals.** — Ability of many to roam over whole continents, checked only by food and climate.

a. Elephant lives on both plains and mountains; ascends Adam's Peak, Ceylon.

b. Tiger swims arms of the sea; has great powers of dispersal, can endure the cold of North China and Tartary as well as the heated jungles of Bengal.

c. Rhinoceros and lion are widely dispersed, area of land and food only limiting their possible range.

d. Apes, monkeys, lemurs, and many small animals leading arboreal lives are much more restricted.

e. Open country essential to some animals, *e.g.* antelopes, zebra, etc.

f. High mountains for goats and ibex.

g. Rivers for beaver, etc.

h. Climate limiting a mammal's range; more often due to change of vegetation as the result of climate than to climate itself.

i. Monkeys limited to equatorial belt of forest 30° wide; due largely to food (fruit). One monkey inhabits Himalayas above snow line (altitude 11,000 feet).

j. Many northern animals bounded by isotherm of 32° — polar bear and walrus.

k. Fossil remains of elephants and rhinoceros found imbedded in ice proves their former range in cold climates.

l. Valleys and rivers as barriers. — Their humidity, etc. Monkeys and birds (trumpeters) on the Amazon.

m. Arms of the sea are barriers. Few mammals can swim very wide areas of water, but many swim well for short distances, *e.g.* jaguar, bear, bison, deer, rodents, etc.; pig's ability to swim.

n. Ice floes and drift timber.

o. Bats, seals, and cetaceans have very great facilities for dispersal.

5. **Birds.** — Though possessing greater powers of dispersal (flight), they are as strictly limited as mammals.

a. Petrels, gulls, and shore birds wide rangers. Most species confined to one or other ocean.

b. Smaller perching birds much more limited.

c. Dispersal of birds by winds; American birds in Europe, etc.

d. Barriers to birds. — Narrow seas and straits often effectual barriers; forest country; mountain ranges rising above woody country; great rivers.

e. Migration of birds — regular, compared with the irregular periodical movements of some mammals (*e.g.* lemming, antelopes, etc.). Movements of fishes more like birds.

f. Migration in Europe. — Constancy of appearance; routes. The nightingale; wide range; antiquity of migrations; past conditions of land; the Mediterranean a dangerous crossing.

g. India and China — birds come in autumn from Europe and Western Asia.

h. North America. — Migrations mostly eastern; many more migratory and many less resident species than in Europe, significance of this. Wood warblers and orioles; cliff swallow; bobolink, its range has increased with extension of wheat and rice growth.

i. South temperate America. —

j. Habit of wandering in birds exaggerated. Why? Instinct; Glacial period; nesting site, more or less regular in many species.

k. Importance of food. — Winged insects and caterpillars, significance.

6. Reptiles and Batrachians. — With exception of marine forms, reptiles are scarcely more fitted for crossing ocean and seas than are mammals.

a. Reptiles on oceanic islands.

b. Several groups differ considerably in dispersal and overcoming powers — snakes most dependent on climate, not found above 62° in North America; nor on mountains to any great height (Alps 6000 feet). Different stations of snakes.

c. Lizards, tropical as a rule, but go farther north and reach higher altitudes than snakes (10,000 feet in Alps). Dispersed over the ocean probably in egg state to some extent, as they inhabit islands where there are no snakes or mammals.

d. Batrachians (frogs, etc.). — Wider ranging than reptiles; deserts and oceans are barriers to them, as dryness and salt water are fatal.

7. Fishes, Fresh-water and Marine. —

a. Temperature is a barrier.

b. Depth of water a barrier.

- c.* Limited migration.
- d.* Dispersal by winds.
- e.* Eggs carried by birds.

8. Mollusca: Marine, Fresh-water, and Land. —

a. Marine mollusca. — Many kinds drift in mid ocean; probably only limited by temperature, presence of certain enemies, and scarcity of food. Slow-moving forms, as whelk and cockle, range widely, as their young are free swimming.

b. Fresh-water mollusca. — We would suppose them to be limited to particular river basins, but they are widely dispersed. Eggs become attached to feet of aquatic birds. Salt water fatal to them.

c. Land shells. — A more difficult problem; very sensitive to salt water, and not in places much frequented by aquatic birds, still are widely dispersed over globe and in most oceanic islands, possessing remarkable vitality, *e.g.* snail glued down to tablet in British Museum for four years. Darwin's experiment shows that when they form a membrane over mouth of shell, can resist sea water for some time (14 days). Attached to feet of wading birds which wander inland. Even though it should only occur once in a thousand years, a few snails carried to a distant island would by these means eventually stock it.

9. Dispersal of Insects. — Winged insects have varied means of dispersal over globe; many can fly immense distances; many carried far out to sea by storms, *e.g.* hawk moths 250 miles from tropical shores; Darwin caught a locust 370 miles from nearest land. Tropical insects in the London docks. Great vitality of insects, *e.g.* beetles in strong spirit and in boiling water. Barriers to insect — presence or absence of certain forms of vegetation; parasitic and mimicking species depend on presence of other animals; enemies to the several stages of insect existence form a barrier.

10. Distribution affected by Changed Conditions of Earth's Surface. —

a. Physical geography — contour and relief; depth of water; position of desert, lake, and forest; ocean currents; climate; winds, etc. — very important.

b. Relations of land and water to each other — area of water three times that of land. *Elevation and subsidence.* Large masses of land have probably been more isolated. Shallow parts of ocean are mostly in the vicinity of land; significance of these facts.

c. Continental areas. — Land mass almost continuous, consists only of three masses: 1, American; 2, Asia-African; 3, Australian.

d. Slow process of upheaval has always produced land close to continental areas.

e. Present isthmuses small and insignificant compared with countries they unite: Suez a desert barrier; Panama a more effectual connection.

f. Asia: Himalayas a great transverse barrier to many species.

g. Africa: Great Sahara Desert, transverse barrier.

h. Europe and Asia cannot be separated zoologically.

i. Recent changes in continental areas: Sahara was under water at a very recent period; sea shells, identical with living Mediterranean species, found abundantly as high as 900 feet; deposits of salt abundant; a species of fish found in inland salt lake, identical with one in Gulf of Guinea.

j. Mediterranean has suffered subsidence in parts; submerged banks 300 to 1200 feet, other parts 13,000 feet deep.

k. Remains of African elephant, of a fossil elephant, and two species of hippopotamus found in Sicilian caves; in Malta, three species of fossil elephant; significance of these facts.

l. Many shells and corals of West Indies and Pacific coast are identical; some living fishes also; significance.

11. Glacial Epoch. — Effect on existing species; evidence of 'drift.'

a. Many fossil animals and plants show that, previous to glacial epoch, the climate of Central Europe was much warmer than now, and a temperate climate extended into Arctic regions, allowing a magnificent vegetation to flourish within 12 degrees of pole.

b. Gradual refrigeration of climate taking place, life forms were driven southward or exterminated, *e.g.* mammoth, reindeer, etc.

c. Evidences of the effect of Glacial epoch upon life, seen in recent remains of shells with living arctic representatives; in arctic and alpine plants, White Mountains and Labrador; Pyrenees and Scotland and Scandinavian Peninsula; in changes of vegetation, *e.g.* prehistoric Denmark. Old forests, peat bogs, kitchen-middens.

d. Cause of glaciation (Wallace, "Island Life," Croll, "Climate and Time").

12. Organic Barriers. — Complex effects.

a. Goats in island of St. Helena, destroying forests.

b. Swine in Mauritius, exterminating the dodo. Swine kill poisonous serpents.

c. Cattle often prevent growth of trees; effect on various species of insects and birds.

d. Effect of Paraguay fly; effect of South African tse-tse fly on different animals.

e. Cats and clover (Darwin).

13. Zoögeography.—Food, climate, and physical character of land of utmost importance in making an animal what we see it.

a. Local *habitat* or character of country.

b. Diversity; how produced.

c. Early types were fewer; present types more numerous, and their forms more complex.

d. Effect of surrounding conditions and power to wander, the two great factors in producing diversity; different parts of the earth characterized by different animals as a result of these two factors.

e. Earth divided accordingly into zoölogical regions.

f. The animals of a particular geographical region are collectively called its *fauna*.

g. We would suppose all animals closely allied to inhabit the same or continuous areas of country, and *vice versa*.

h. Certain widely distributed animals are not found in certain countries, *e.g.* bears and deer not found in tropical or South Africa.

i. Certain closely allied animals are found widely separated, *e.g.* tapirs, anthropoid apes, and camel tribe. These are problems to be considered; their solution found in the two factors and in the past history of the earth and its inhabitants.

j. Importance of geology, physical geography, and the study of fossils or palæontology.

k. Most important class of animals in determining regions are mammals; then birds; other groups follow.

l. Primary divisions dependent on great barriers—temperature, ocean, desert.

m. *Transition Zones*—areas between two distinct regions where there is a mingling of the two faunas.

14. Palæarctic or Eurasiatic Region.—(*North Temperate Realm.*)

a. Barriers.

b. Characteristic animals—almost entire family of moles; peculiar, carnivores; camels; deer; yak; chamois; saga-antelope and addax;

peculiar rats ; dormice ; tailless hares. Peculiar genera and species of birds numerous.

c. Several sub-regions characterized by certain peculiar species. Local barriers.

15. Ethiopian Region.— (*Indo-African Realm.*) — Africa south of the Atlas Mountains and the islands of the Madagascar* group.

a. Characteristic animals — peculiar apes, gorilla, and chimpanzee ; lemurs, hippopotamus and giraffe strictly peculiar ; such highly characteristic groups as hyænas ; several* cats ; hyrax ; rhinoceros (two horned) ; zebra and numerous antelopes.

b. But no bears, moles, camels, deer, sheep, goats, or wild cattle.

c. Peculia genera and species of birds numerous — bee-eaters, horn-bills, shrikes, crows, starlings, cuckoos, and the peculiar plantain-eaters ; the Guinea-hen and secretary bird highly peculiar.

d. Altogether a very isolated and peculiar region.

16. Oriental Region.— (*Indo-African Realm.*) — India, China, and Malay islands as far as, and including, Java and Borneo.

a. Barriers.

b. Rich and varied animal life. — Orang-outang ; distinct family of lemurs ; remarkable insectivore (flying lemur) ; peculiar carnivora (civets, weasels, etc.) ; peculiar dolphin found in Ganges and Indus ; peculiar deer-like form (chevrotain) ; buffalo and zebu ; rhinoceros and elephant, etc. Numerous peculiar birds.

17. Australian Region.— Australia and Polynesia ; one of the best defined regions, including Australia and the adjacent islands as far east as the Sandwich and Marquesas groups. The island continent of Australia is in the track of the southern desert zone ; no inland mountain chain ; interior a parched desert.

a. Highly characteristic mammals. — Marsupials and monotremes ; rats, mice, and bats the only other mammals.

b. Marsupials diversified to fill every position in economy of Nature — carnivorous, insectivorous, herbivorous, etc.

c. Birds highly peculia, — no true finches, woodpeckers, vultures, nor pheasants ; but many parrots, birds of paradise, lyre birds, mound-makers, cassowaries, brush-tongued paroquets strictly peculiar ; pigeons and kingfishers remarkably developed.

* Dr. J. A. Allen separates Madagascar as a distinct *Lemurian Realm*.

18. **Nearctic Region.** — (*North Temperate Realm.*) — North America and the highlands of Mexico.

a. Characteristic animals — star-nosed mole; peculiar weasels; raccoon; peculiar seals on coast; prong buck, musk sheep, and Rocky Mountain goat; musk rat, pouched rats or gophers, prairie dog, and chipmunk; Canada porcupine and white-footed mouse.

b. A number of distinct birds — wood warblers, wrens, finches, etc.

c. Subregions — local barriers.

19. **Neotropical Region.*** — South and Central America; richest in peculiar forms of any region in the world; isolated.

a. Characteristic mammals — two families of tailed monkeys; blood-sucking bats; chinchilla and cavy; tree porcupines; sloths, armadillos, and ant-eaters (*Edentata*); marsupials, (opossums); one mole-like form; llama and several deer, the only ruminants; peccary and tapir the only non-ruminating hoofed mammals.

b. Birds highly peculiar — humming birds, ant thrushes, trumpeters, toucans, puff birds, jacmars, etc.

c. Relations of Nearctic and Neotropical regions; significance.

20. **Geological Distribution.** — Study of the geological history of animals (fossils) reveals their relations to *time*, as geographical distribution reveals their relations to *place*.

a. Many problems of distribution can only be solved by a survey of past conditions.

b. Origin of existing species; immense lapse of time since their first appearance.

c. Animals change with changing physical conditions; great length of time required.

d. Rapid multiplication a cause of dispersal over newly raised areas of land.

e. Most radical difference between species dependent on degree of isolation by most effectual barrier.

f. Spread of species follows geological change; extreme slowness of the movement.

* Dr. Allen's classification divides South America into two distinct realms, the *American Tropical* and the *South American Temperate*.

21. Divisions of Time. — Geological history divided into eras, ages, periods, and epochs, each determined by certain great changes that have taken place in physical geography, climate, and forms of life.

a. Each great division of time recorded in a *rock formation* or *rock system*; the life remains found in each are termed its *fossils*.

b. Each division is characterized by the dominance of some particular class of life forms, *e.g.* age of fishes; age of coal plants.

c. Each age has gradually merged into the succeeding one; in one age, the life of the next begins to appear.

d. Each class does not die out, but its species become *changed* according to laws already pointed out, and in succeeding ages new types appear higher than those of preceding age, more complex in structure (ascending series).

22. Dynamics. — Great rock beds of earth's crust as we see them to-day have resulted from the ceaseless action of ocean, rain, rivers, ice, wind, and frost upon ancient land areas which have appeared and disappeared from time to time owing to certain internal conditions producing upheaval (elevation) and sinking (subsidence) of crust.

a. These same geological processes are going on to-day; have always been going on very slowly.

b. Sudden revolutions have occurred in earth's history, causing great destruction of life; life was not entirely extinguished.

c. Then, as now, shells lived in ooze of sea bottom or were cast up on ancient beaches; leaves and branches of trees and bodies of animals were carried down by rivers and buried in the mud of lakes and seas.

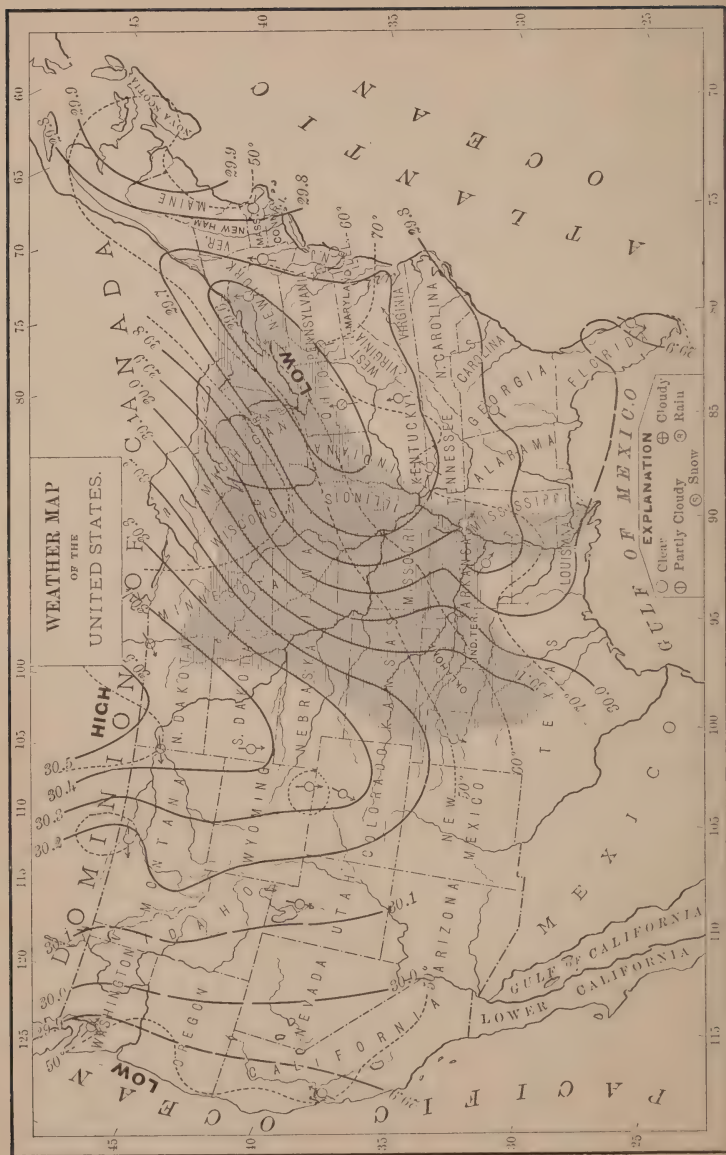
d. Their remains have been deposited in the mud or sand, which in the long lapse of time has become hardened into rock (shale, slate, sandstone, limestone, etc.), and are preserved to the present day as fossils.

e. Generally only the hard parts of animals are preserved (shell, bone); often only their impressions or casts.

f. Kind of fossils found depends on: 1, kind of rock; 2, country; 3, age.

23. Chronology. — Five great *eras* of geological history, each embodied in a corresponding system of rocks —

a. Eozoic (dawn of animal life), seen in Archæan or Primary rock system.



- b.* Palæozoic (old life) — Silurian, Devonian, and Carboniferous ages ; rocks of transition series.
- c.* Mesozoic (middle life) — Triassic, Jurassic, and Cretaceous ; rocks of Secondary series.
- d.* Cenozoic (recent life) — Tertiary and Quaternary periods and deposits.
- e.* Psychozoic (rational life), — present system of sediments.

VI.—HOW TO READ A WEATHER MAP.

This map represents the data collected by the Weather Bureau at Washington, D.C., from points all over the United States for a certain day in May, 18—. A synopsis of the weather, accompanying the map, was stated thus : “The storm has moved rapidly during the past twenty-four hours, and is now central over the Lakes Erie and Ontario District. An area of high barometer, with clear and cooler weather, occupies the Northwest, following after the storm. Generous showers have occurred over nearly all the country during the past three days, in many localities the fall being very heavy.”

Explanation. — The heavy black lines are *isobars* ; the dotted lines, *isotherms*. Arrows fly with the wind, and the signs of the ring in their shafts indicate states of the weather, thus : ○ Clear ; ⊕ Partly Cloudy ; ⊕ Cloudy ; ☔ Rain ; ❄ Snow. Horizontal lines colored pink (not shown in this map) indicate *warmer*, 10° or more. Similar lines colored purple (on this map horizontal lines showing a faintly shaded area) indicate *colder*, 10° or more. Close set vertical lines (shown on map) indicate a rainfall of $\frac{1}{4}$ inch or more. The isobars indicate the pressure in tenths of an inch as shown by the figures at their ends. The isotherms represented are those of 50°, 60°, and 70° F. A considerable area of cold is indicated on the map in the storm's wake incident to the anticyclone in the Northwest.

This storm developed in the Rocky Mountain Region, and was one of the most disastrous in many years. It swept eastward over the United States passing out onto the Atlantic in a rather narrow path.

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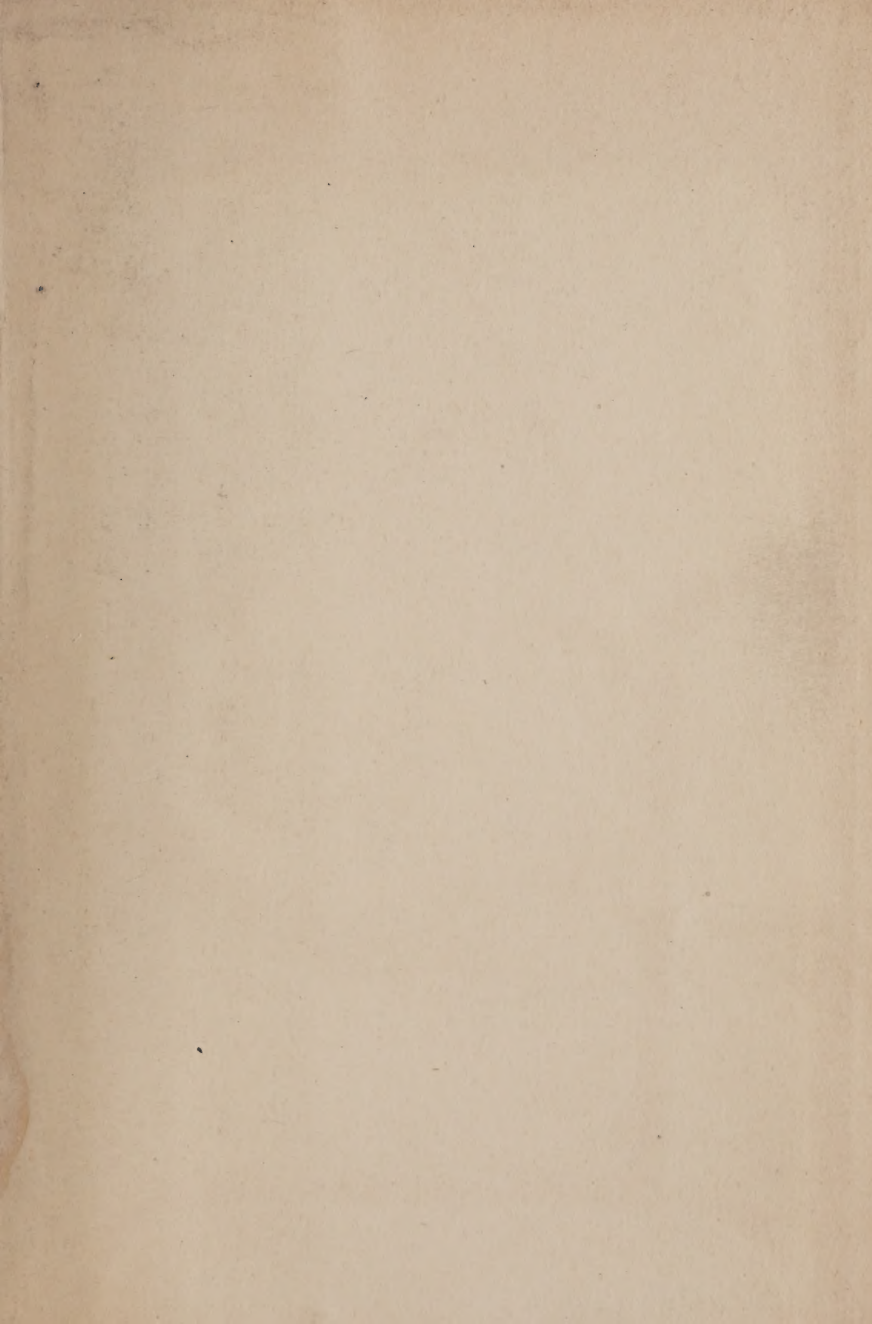


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